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BATTLEFIELD
COUNTERMEASURES
AND SURVIVABILITY

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AIRCRAFT BATTLEFIELD COUNTERMEASURES AND SURVIVABILITY (ABCS)

PREFACE

MODERN BATTLEFIELD CONCEPTS AND OPERATIONS

Advances in weapons systems and electronic technology are significantly affecting military concepts and operations. These advances place increasingly high demands for coordinated efficiency on the modern battlefield. In view of the lethality of the high threat environment, current doctrine emphasizes winning the first battle as it might well be the last. Additionally, we must win while outnumbered. Therefore, battlefield operations concepts for the future are leaning toward greater mobility with more and smaller maneuver battalions. The orientation is toward organization around weapons systems and the combined arms team. Aviation units are an integral part of the combined arms team.

WEAPONS SYSTEMS CONCEPTS

Long-range, high-velocity tank cannon and antiarmor missile systems now domi-

nate the battlefield. Air defense weapons systems cover the air above the battlefield, affecting the tactics of close air support. Improved artillery and other indirect fire weapons are capable of massing large amounts of fire or destroying pinpoint targets in rapid succession. Tactical air support with a wide array of extremely accurate weaponry, increased payload, and on-station time provides a devastating punch to the battlefield. The attack helicopter gives the commander the capability of massing great amounts of firepower at the critical time and place. Advances of electronic warfare technology have added a new dimension of lethality to the battlefield. Night vision aids permit effective combat operations around the clock. Smaller, more efficient nuclear weaponry now makes its use less threatening to nearby friendly forces or communities, but more lethal in the immediate target area. This weaponry, with increased accuracy and mobility, affords the capability to project combat forces rapidly on the battlefield and to any place in the world.

CONTENTS

PREFACE

i

CHAPTER ONE

GENERAL

1-4

CHAPTER TWO

SURVIVAL OF THE

AIR DEFENSE THREAT

5-31

CHAPTER THREE

SURVIVAL OF THE

ARTILLERY THREAT

32-39

CHAPTER FOUR

SURVIVAL OF THE

TACTICAL AIR THREAT

40-58

CHAPTER FIVE

SURVIVAL OF THE

ELECTRONIC WARFARE (EW)

THREAT

59-88

STATEMENT
The word "he" is intended to include both the masculine and the feminine genders. Any exceptions to this will be so noted.

1 PURPOSE**2 SCOPE**

2 ARMY AVIATION OBJECTIVES
3 PRINCIPLES OF SUCCESS

5 THE AIR DEFENSE THREAT**6 THE SMALL ARMS THREAT**

7 EMPLOYMENT TACTICS AND TECHNIQUES
8 SURVIVABILITY AND COUNTERMEASURES
10 FUTURE TRENDS
10 SMALL ARMS ENGAGEMENT SIGNIFICANCE

11 THE AIR DEFENSE ARTILLERY (ADA) THREAT

12 EMPLOYMENT TACTICS AND TECHNIQUES
13 SURVIVABILITY AND COUNTERMEASURES
16 FUTURE TRENDS

17 THE AIR DEFENSE MISSILE THREAT

19 EMPLOYMENT TACTICS AND TECHNIQUES
20 SURVIVABILITY AND COUNTERMEASURES
29 FUTURE TRENDS

32 THE ARTILLERY THREAT

33 EMPLOYMENT TACTICS AND TECHNIQUES
37 SURVIVABILITY AND COUNTERMEASURES
39 FUTURE TRENDS

40 THE TACTICAL AIR THREAT**41 THE HIGH PERFORMANCE AIR THREAT**

41 EMPLOYMENT TACTICS AND TECHNIQUES
44 SURVIVABILITY AND COUNTERMEASURES

53 THE HELICOPTER THREAT

54 EMPLOYMENT TACTICS AND TECHNIQUES
55 SURVIVABILITY AND COUNTERMEASURES
57 FUTURE TRENDS

59 THE ELECTRONIC WARFARE (EW) THREAT

60 SURVIVABILITY COUNTERMEASURES AND COUNTER-COUNTERMEASURES

60 THE SIGNAL INTERCEPT THREAT

61 COUNTERMEASURES AND COUNTER-COUNTERMEASURES

64 THE DIRECTION-FINDING THREAT

68 COUNTERMEASURES AND COUNTER-COUNTERMEASURES

69 THE JAMMING THREAT

73 COUNTERMEASURES AND COUNTER-COUNTERMEASURES

77 THE DECEPTION THREAT

78 COUNTERMEASURES AND COUNTER-COUNTERMEASURES
80 TACTICAL COMMUNICATIONS TECHNIQUES

CHAPTER SIX

SURVIVAL OF THE NUCLEAR,
BIOLOGICAL, CHEMICAL (NBC)
THREAT
89-108

89 THE NBC THREAT**90 THE NUCLEAR THREAT**

90 NUCLEAR WEAPONS EFFECTS
98 COUNTERMEASURES AGAINST THE
NUCLEAR THREAT

104 THE BIOLOGICAL THREAT

104 COUNTERMEASURES AGAINST THE
BIOLOGICAL THREAT

105 THE CHEMICAL THREAT

107 COUNTERMEASURES AGAINST THE
CHEMICAL WARFARE

CHAPTER SEVEN

ARMY AVIATION OPERATIONS
DURING PERIODS OF REDUCED
VISIBILITY IN THE HIGH
THREAT ENVIRONMENT
109-119

**109 REDUCED VISIBILITY
CONDITIONS****112 THREAT NIGHT VISION
CAPABILITIES**

114 COUNTERMEASURES DURING PERIODS OF
REDUCED VISIBILITY
117 REDUCED VISIBILITY EQUIPMENT AIDS
119 TACTICAL INSTRUMENT FLIGHT
119 REDUCED VISIBILITY OPERATIONS OTHER
THAN NIGHT TACTICAL INSTRUMENT FLIGHT

CHAPTER EIGHT

PREMISSION PLANNING IN
THE HIGH THREAT
ENVIRONMENT
120-158

**120 SURVIVAL IN THE HIGH
THREAT ENVIRONMENT**

140 COORDINATING AGENCIES FOR ARTILLERY
FIRE SUPPORT
141 PREMISSION PLANNING
141 PREPLANNED ARTILLERY/MORTAR FIRES
142 IMMEDIATE FIRES
148 SHORT-RANGE GUN AND MISSILE SYSTEMS
148 MEDIUM-RANGE ADA MISSILE SYSTEMS
148 LONG-RANGE AD MISSILE SYSTEMS
148 COORDINATING AGENCIES
150 COMMAND AND CONTROL
151 PREMISSION PLANNING
156 PREMISSION PLANNING
157 PREMISSION PLANNING
157 PREMISSION PLANNING

CHAPTER NINE

ARMY AVIATION UNIT
SURVIVABILITY TRAINING
159-185

159 INTRODUCTION

160 AIRCREW TRAINING PROGRAM
178 AVIATION UNIT TRAINING PROGRAM
184 AIRCREW/ATC TRAINING PROGRAM

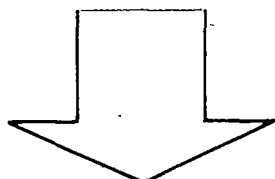
APPENDIX A

REFERENCES
186-189

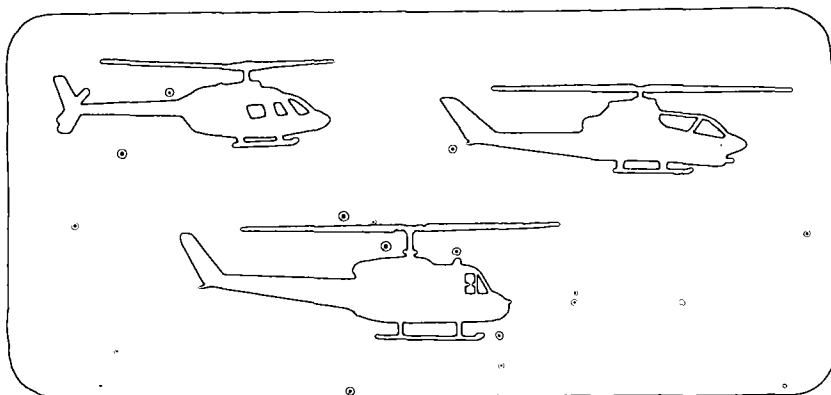
APPENDIX B

GUIDE TO WRITING AN ABC
ANNEX TO THE UNIT SOP
190-194

CHAPTER ONE



GENERAL

**PURPOSE**

The primary purpose of this manual is to present and discuss battlefield countermeasures, techniques, procedures, and concepts that enhance the survivability of Army aviation units in a high threat environment. This publication should be used as a guide for developing unit tactics and techniques, to avoid detection and destruction by hostile forces; and as an aid in formulating unit standing operating procedures (SOP) and training plans. Aviation unit personnel should use this publication to become familiar with aircraft survivability equipment and techniques and how these can be integrated into training and combat operations to increase aviation unit staying power in the face of a highly sophisticated enemy threat.

The intent of this manual is to make the individual aviator and commander aware of the threat and survival countermeasures applicable under various combat situations. Army aviation units are part of the combined arms team; therefore, combined arms employment is stressed as the key to survival throughout this manual. Tactics, techniques, and countermeasures used in the manual are intended as a general guide. The complexity of the future battlefield dictates that multiple solutions to demanding challenges will be required.

SCOPE

This manual presents the primary threat the Army aviator will find on the battlefields of the next war, where weapons can be expected to be located, a general description of the mass and mixture of threat weapons that normally will be used to engage aircraft, and how these weapons are integrated into the enemy air defense plan. Aircraft survivability equipment that is either currently available or under development and production is discussed with accompanying concepts of how it should be integrated into both active and passive counter-measures. Aviation unit commanders, as well as individual Army aviators, should become thoroughly familiar with the techniques, procedures, and concepts presented in this field manual so that they can tailor them to their unit or mission needs in order to counter the enemy threat, survive on the battlefield, and win the first battle of the next war.

Mission accomplishment and survivability of Army aviation units depend on the interaction of the combined arms team and more specifically are a function of training, hardware, and tactics. To the individual aviator, survival will include the mix and interaction of many variables.

ARMY AVIATION OBJECTIVES

- To augment the capability of the Army to conduct prompt and sustained land combat.
- To provide the commander with the mobility, firepower, and staying power needed to win the first battle.
- As a member of the combined arms team, to win while outnumbered.

Succeeding chapters will identify specific threat weapons systems capabilities and their employment and tactics. We will then analyze these systems and discuss available countermeasures in conjunction with the combined arms team employment and tactics during sustained operations in the high threat environment. Finally, we will discuss training programs that can be tailored to the aviation unit to insure a high proficiency training level we need to prepare us for the first battle of the next war should that possibility become reality.

The assistance of all aviation users was solicited to insure the applicability of the doctrine presented in this manual. Readers are encouraged to submit recommended changes and comments to improve the publication. Reasons, as well as substitute statements or paragraphs, should be provided for each recommended change. Comments should be keyed to specific page, paragraph, and line of the manual. Comments/recommended changes should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, United States Army Aviation Center and Fort Rucker, ATTN: ATZQ-TD-TL-DS, Fort Rucker, Alabama 36362.

PRINCIPLES OF SUCCESS

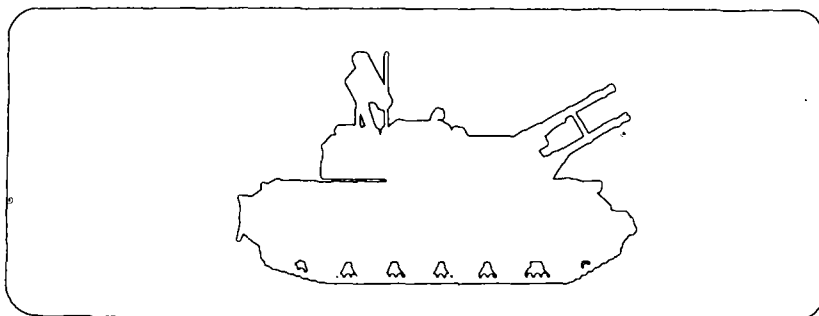
- **Training Proficiency**
- **Flying Techniques and Tactics**
- **Knowledge of the Threat/Enemy Situation**
- **Knowledge and Use of Aircraft Survivability Equipment**
- **Knowledge of Combined Arms Mission**
- **Knowledge of Friendly Situation**
- **Use of Available Support**
- **Premission Planning**
- **Human Factors**

SUMMARY

Given the above weaponry coupled with battlefield operations concepts, several factors affect our ability to survive and win while outnumbered. Intelligence systems must be extremely responsive and accurate. Sufficient forces, firepower, and support must be massed at the critical time and place. The combined arms team must be employed and coordinated so as to achieve maximum efficiency for the given and changing situation. Last but not least, the commanders, crews, and individual soldiers must have confidence through training proficiency to survive and inflict maximum casualties. No single weapon, arm, or service can hope to win by itself. Each element of the combined arms team has special capabilities contributing to the overall success of the mission.

Properly employed, Army aviation units can contribute significantly to the winning of the first battle.

CHAPTER TWO

SURVIVAL
OF THE AIR DEFENSE
THREAT**THE AIR DEFENSE THREAT**

With the evolution of the helicopter on the modern battlefield, foreign armies have become well aware of the threat posed by even a small group of helicopters. The entire threat combined arms team is trained to engage this type of target as well as fixed-wing and high-performance aircraft. In deploying air defense, the enemy can be expected to follow four basic principles: (1) Mass, (2) mix, (3) mobility, and (4) integration.

Mass — The principle of mass is achieved by positioning weapons and weapons systems within a tactical unit so that their combined fires can be brought to bear on a single target, increasing kill probability.

Mix — Mix is achieved by employment of gun and missile systems so that the limitations of one offset the other. Equipment diversity and redundancy are emphasized in air defense target acquisition means to offset countermeasures that could be employed against them.

Mobility — Threat air defense systems are highly mobile so as to provide an effective air defense umbrella for threat operations. Mobility also provides a means of survival for threat air defense systems.

Integration — Integration is achieved by incorporating air defense systems forward into the scheme of maneuver and rearward through command and control systems to provide air defense coverage in depth.

To survive and defeat such an array of air defense systems require the efforts and capabilities of the entire combined arms team for suppression of the whole spectrum. For the aviation unit and individual aviator, a thorough knowledge of the doctrine and principles contained in FM 90-1, *Employment of Army Aviation Units in a High Threat Environment*, and FM 1-1, *Terrain Flying*, is mandatory.

Threat air defense weapons systems presented in this chapter are typical of those that will confront Army aviation units on the battlefield today and in the near future. Their lethality is the most formidable ever faced in the history of military operations. Threat doctrine and tactics discussed are representative of the most formidable threat countries. Army aviation countermeasures and survival techniques reflect current aviation employment doctrine with combined arms tactical application and survivability equipment now available or under development.

THE SMALL ARMS THREAT

Threat small arms pose a significant problem to the aviator if for no other reason than that they are employed in vast numbers. It is, therefore, appropriate that we begin our discussion of the air defense threat at the foundations. In considering the small arms threat, it is important to note that effective ranges of employed weapons systems vary from 300 meters to 1400 meters. Table 1 provides a list of the most common threat small arms and machinegun systems and capabilities.

TABLE 1 SMALL ARMS WEAPONS SYSTEMS			
WEAPON NOMENCLATURE	MAXIMUM EFFECTIVE ANTI- AIRCRAFT RANGE	ACQUISITION MEANS	ASSIGNMENT
AKM 7.62mm	300m	Optical	Individual soldier
RPK 7.62mm LMG (Bipod)	600m	Optical	Crew-served
PK 7.62mm LMG	600m	Optical	Crew-served Vehicle-mounted
12.7mm MG	1000m	Optical	Platoon-level Vehicle-mounted
14.5mm MG	1400m	Optical	Platoon-level Vehicle-mounted

Air defense begins with the individual soldier. In motorized rifle companies, a portion of the command is always designated to deliver massed fire on attacking aircraft. Small arms weapons systems and machineguns are employed with the individual soldier, mechanized wheel and track vehicles, and tanks. Each combat soldier is trained in antiaircraft firing techniques and visual identification of hostile aircraft. Emphasis is placed on constant visual reconnaissance for aircraft operating nap-of-the-earth (NOE) at NOE flight modes followed by rapid engagement.

EMPLOYMENT TACTICS AND TECHNIQUES

Rifle, AKM 7.62mm -----	346
LMG, PK 7.62mm (BMP) -----	57
MG, COAX, 7.62mm (BMP, tank)-----	45
HMG, 12.7mm (tank)-----	13
HMG, 14.5mm (BRDM) -----	1 or more

A typical threat motorized rifle battalion, reinforced by one tank company, may have the following small arms available for use against aircraft:

Rifle, AKM 7.62mm -----	210
LMG, PK 7.62mm (BMP) -----	19
MG, COAX, 7.62mm (BMP, tank)-----	41
HMG, 12.7mm (tank)-----	31
HMG, 14.5mm (BRDM) -----	3 or more

A typical threat tank battalion, reinforced by one motorized rifle company, may have the following small arms available for use against aircraft:

SURVIVABILITY AND COUNTERMEASURES

☐ ACTIVE COUNTERMEASURES

☉ *Suppression:* Direct and/or indirect fire is the most effective active countermeasure against small arm weapons. During combined arms team operations, direct and indirect fire will be integral to the scheme of maneuver. During Army aviation reconnaissance, logistics, surveillance, or covering force operations, combined arms team fire support may not be available from infantry, armor, or attack helicopter resources. However, indirect artillery fire support or tactical air support may be available to support missions of this nature. Chapter 8 contains premission planning considerations and procedures regarding the use of these fire support means.

COMBINED ARMS SUPPRESSION IS THE MOST EFFECTIVE ACTIVE COUNTERMEASURE

Another method of suppression available against small arms weaponry is the use of smoke to deny visual acquisition. Smoke munitions are available for suppression by mortar, artillery, and attack helicopter weapons systems. The use of smoke requires knowledge and careful consideration for proper employment. Available smoke munitions and employment procedures are contained in chapter 8.

When using suppression as a countermeasure, the closest or most immediate threat should be suppressed first while maneuvering to a standoff range. Firing first—in heavy volume—and accurately will give you the advantage.

The objective of suppression is to cause the enemy to button-up, take cover, limit his effective fire, deny visual acquisition, or destroy him and his weapons system.

☐ PASSIVE COUNTERMEASURES

☉ *Utilize Terrain Flight Techniques:* As all small arms are dependent on visual acquisition, it only makes sense that the most effective passive countermeasure is to avoid detection. Nap-of-the-earth flight, in conjunction with traveling, traveling overwatch, and bounding overwatch flight techniques, offers the best approach to deny visual acquisition while en route during a mission. Careful flight or map reconnaissance during the premission planning process will take advantage of flight routes that offer the best terrain masking and provide the best pickup zones (PZ)/landing zones (LZ), primary/alternate/supplemental firing positions, and reconnaissance approaches.

NAP-OF-THE-EARTH FLIGHT TECHNIQUES

INCLUDE:

- TRAVELING
- TRAVELING
OVERWATCH
- BOUNDING
OVERWATCH

○ *Employ Standoff:* The use of standoff flight techniques when engaging the enemy or when flying in the vicinity of known/suspected enemy positions is the next most important countermeasure against small arms weaponry. Avoiding detection through the use of terrain flight techniques allows you to gain surprise when engaging the enemy. Once the enemy has been located, or you have been located by the enemy, employing standoff allows you to prevent effective engagement by enemy small arms.

○ *Minimize Exposure Time:* Exposure time can be minimized by taking advantage of available terrain for masking the aircraft. For attack helicopter operations when engaging the enemy, employ fire and maneuver using pop-up firing techniques and preselected multiple firing points. Fixed-wing aircraft must use terrain flight, good route planning, and the maximum possible speed to increase the probability of surprise and to reduce exposure time.

**MASK THE AIRCRAFT
USING AVAILABLE
TERRAIN FEATURES**

○ *Minimize the Aircraft Signature:* The aircraft signature can be minimized by the aviator's being aware of the surrounding environment. Utilize terrain folds and shadows to prevent glint caused by rotor, propeller, plexiglass, or metal. Utilize flight routes, PZs/LZs, and reconnaissance/firing points that offer a terrain background to prevent skylining. Utilize color tones to blend in with the terrain. Be aware of loose debris, snow, and vegetation in the area to prevent rotorwash signature. Be aware that under high temperature conditions, hovering may produce a heat signature enabling threat weapons to engage you if masked behind vegetation. Under these conditions, you must either be masked by terrain features or maintain some forward speed. The aircraft signature is also reduced by presenting the viewer with the smallest portion of the aircraft—the front.

**USE TERRAIN FOLDS
AND SHADOWS TO
PREVENT METAL
REFLECTIONS**

○ *Utilize Available Vulnerability Reduction Equipment:* Wear ballistically hardened helmets, if available, and use the tinted or clear visor to protect your eyes from plexiglass spray should rounds enter the cockpit. Wear armored/ballistic tolerant vests if available and feasible.

FUTURE TRENDS

○ *Aircraft Signature Reduction:* Testing is being conducted to develop aircraft paints and patterns that are low reflective, making aircraft less vulnerable to visual acquisition caused by rotor/metal glint and color tones/patterns. Testing of infrared suppressors has resulted in development of exhaust plume and heat cross-section suppressor kits that can be applied to aircraft to reduce vulnerability to heat-seeking missiles. These suppressor kits will also reduce vulnerability to visual acquisition, especially at night.

New generation Army aircraft (utility tactical transport aircraft system (UTTAS), advanced attack helicopter (AAH), air assault helicopter (ASH)) will have some or all of the above-mentioned features. In addition, the AAH will have flat canopy plexiglass to reduce glint/reflection. Also incorporated in new generation Army helicopters will be a noise-reduction rotor system to reduce audible vulnerability.



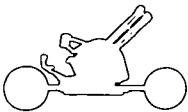
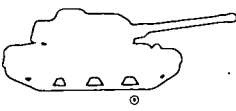
○ *Aircraft Vulnerability Reduction:* Tests on helicopter ballistic tolerance have helped to develop possible modifications to current helicopter tailbooms to provide 23mm ballistic tolerance. Newer generation helicopters (UTTAS/AAH) incorporate improved survivability features such as ballistic tolerant frames and critical components (23mm), redundant critical components (engine hydraulic controls), fail-safe rotor systems, improved armored protection, and fail-safe lubrication systems.

**SMALL ARMS
ENGAGEMENT
SIGNIFICANCE**

Threat small arms are just the tip of the iceberg. Once detected and engaged by enemy small arms, expect engagement by threat armor, artillery, air defense, or tactical aircraft.

THE AIR DEFENSE ARTILLERY (ADA) THREAT

Table 2 depicts most common threat air defense artillery (ADA) systems. These systems are a cross-section of their capability, but are not all-inclusive.

TABLE 2 THREAT AIR DEFENSE ARTILLERY SYSTEMS			
WEAPON SYSTEM	MAXIMUM EFFECTIVE ANTI-AIRCRAFT RANGE AND CAPABILITY	ACQUISITION MEANS	ASSIGNED TO
*ZPU-4 (14.5mm) 	Range: 1400m	Optical	ADA units of some motorized rifle regiments and divisions
*ZU-23 (23mm) 	Range: 2500m	Optical	ADA units of some motorized rifle regiments and divisions
ZSU-23-4 (23mm) 	Range: Optical - 2500m Radar - 3000 m Elevation: +8° to +87°	Radar and optical	ADA units of motorized rifle and tank regiments and divisions
ZSU-57-2 (57mm) 	Range: 4000m Elevation: -5° to +85°	Optical-mechanical computing sight	ADA units in tank regiments of tank and motorized rifle divisions
S-60 (57mm) 	Range: Optical/ Mechanical - 4000m Radar - 6000m Elevation: -2° to +87°	Radar and optical mechanical computing sight	Antiaircraft regiment of tank and motorized rifle divisions

*System being phased out of threat frontline units.

EMPLOYMENT TACTICS AND TECHNIQUES

Threat forces employ air defense artillery to protect combat formations, installations, and troop movements from air attack. ADA weapons may occupy carefully selected positions in order to ambush helicopters flying NOE. Threat air defense artillery units are organic to regiment division. Priority is assigned to engage motorized rifle or tank units, command posts, and critical support activities.

○ **THE ATTACK:** In the attack formation of a motorized rifle division, reconnaissance units are used to find the limits of enemy defensive positions. The main body is usually organized in two echelons. The first echelon is responsible for accomplishing the primary mission—usually to penetrate or bypass enemy defensive positions and drive into rear areas, command posts, and trains areas. The second echelon is used to contain or mop up the penetrated or bypassed defensive positions. A tank-heavy reserve follows to provide additional support or a counterattack capability if necessary. Air defense artillery is employed in all elements and in rear areas. A typical battle disposition for a threat motorized rifle division with air defense artillery elements is shown in figure 2-1. Frontages for main attacks will be less.

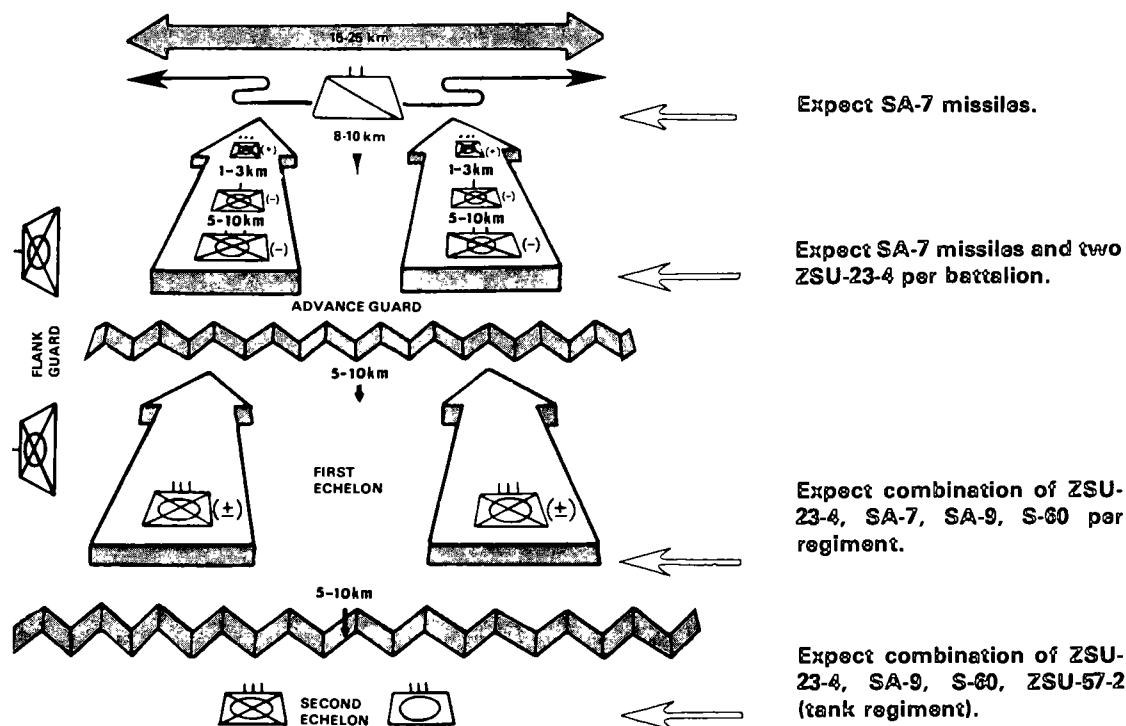


FIGURE 2-1. MOTORIZED RIFLE DIVISION MOVING TO CONTACT.

○ **THE DEFENSE:** According to Soviet doctrine, defense is a temporary expedient. Offensive action is decisive. The threat recognizes two types of defense: (1) The hasty defense is most often conducted by first echelon units during offensive action when the advance has been stopped and (2) the deliberate defense is conducted when the offensive advance is halted for more than a few hours. A regiment in a hasty defense deploys in very much the same manner as one advancing to contact. The deliberate defense is organized into a security zone and main defensive belt as depicted with ADA below.

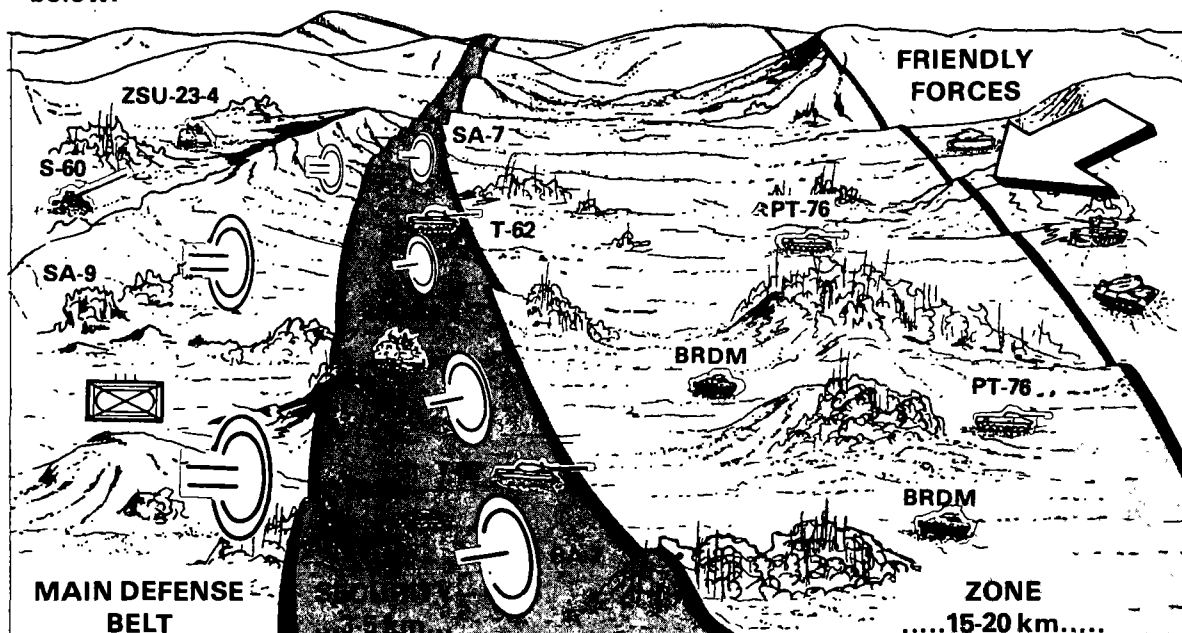


FIGURE 2-2. THREAT DEFENSE IN DEPTH.

□ ACTIVE COUNTERMEASURES

○ **Suppression:** The principles of suppression by fire and smoke remain valid for threat air defense artillery operating in optical modes. Suppression by fire of threat air defense artillery capable of operating in multiple radar/optical modes (ZSU-23-4 and S-60) includes the added benefit of possibly damaging the radar, forcing the weapon into a less range-effective optical mode. Then smoke can be employed to deny visual acquisition. Two things must be remembered about the use of smoke suppression: (1) It does not affect the radar mode of the ZSU-23-4 or the S-60 and (2) it should be used as a temporary expedient to either maneuver to cover, deceive the enemy as to your true intentions, or buy time to destroy the weapons system or other threat weapons by fire.

SURVIVABILITY AND COUNTERMEASURES

Indirect fire offers the safest means of suppression. When using indirect fire, effective standoff ranges can be employed as a complementary countermeasure. When employing the tube-launched, optically tracked, wire-guided missiles (TOW) against radar-acquiring air defense artillery, standoff ranges and exposure times are critical.

■ PASSIVE COUNTERMEASURES

● *Utilize NOE Flight Techniques:* In order to avoid detection and survive against threat air defense artillery, especially radar-acquiring systems, it is imperative that the aviator use NOE flight techniques in conjunction with available terrain relief. NOE flight techniques are the most effective countermeasures against threat air defense artillery weapons systems. When utilizing terrain masking techniques, insure that the entire helicopter is masked, if possible, including the rotor system. The rotor system is a key source of radar acquisition by radar-acquiring systems and also produces a glint which may be a visual giveaway.

STANDOFF RANGES AND NOE FLIGHT TECHNIQUES WORK WELL TOGETHER

● *Employ Standoff:* Use standoff ranges in conjunction with NOE flight techniques to maximize your survivability probability. In order to effectively employ standoff, you must know where to expect enemy air defense artillery to be located in threat attack and defense formations. General guidelines have been provided in this chapter, but current battlefield intelligence reports will provide the best source of information during your premission planning process. The general guideline for optimum standoff ranges against the ZSU-23-4 is that you should get no closer than 2,500 meters at NOE flight levels.

● *Minimize Exposure Time:* For aircraft that are not operating out of effective engagement ranges of threat air defense artillery systems, exposure time is critical. Again, a general guideline for exposure time against the ZSU-23-4, at 2500 meters, is not more than 37 seconds from unmask to remask.

● *Minimize the Aircraft Signature:* Present the smallest target to the threat air defense system. Be aware of your surrounding environment and select positions that afford the best background, cover, shadow and color tones. Be aware of loose debris (vegetation, snow or dust) in the area to avoid rotorwash signature.

● *Use Your Radar Warning Receiver to Maximum Benefit:* To utilize the AN/APR-39 or AN/ALR-46 radar warning receiver to maximum benefit, the aviator must be aware of receiver indications and when to initiate other countermeasures in conjunction with them. Proper training with your radar warning receiver will enable the aviator to recognize these indications. The tracking indication is the most critical for Army aircraft. Upon indication that the aircraft is being tracked, the best countermeasure is to seek cover and mask. *Caution: Be sure the rotor system is masked.* Due to the position of the radar warning receiver, you may be receiving no warning indication but may still be tracked and engaged due to rotor system exposure. If the aircraft is unable to mask, fly away from the threat weapons system upon indication of being tracked while descending as low as conditions permit. Fixed-wing aircraft being tracked while operating at altitude must take immediate evasive action to seek the cover of terrain.

**BEFORE FIRING, THREAT
AIR DEFENSE ARTILLERY
RADAR OPERATES
THROUGH:**

- SURVEILLANCE
 - ACQUISITION
 - TRACKING
-

● *Employ in Mass:* When engaging threat air defense artillery weapons systems, multiple helicopter engagements of one target at standoff ranges, utilizing radar warning receiver indications, and minimizing exposure time can insure destruction of the most formidable weapons system. This will allow subsequent engagement of less range-effective threat weapons systems. Unless out of range of threat air defense artillery, engage these systems first; then concentrate on threat weapons systems that are at a range disadvantage.

○ *Utilize Deception:* When employing in mass, utilizing NOE radar warning receiver indications, one helicopter can be used as a decoy long enough for others to maneuver or engage threat air defense artillery weapons systems. When employing this tactic, the decoy helicopter must be cognizant of exposure time or tracking indications of his radar warning receiver in order to mask prior to being engaged.

**REPORTING THREAT
WEAPONS LOCATION
AIDS IN THE BATTLE
FOR SURVIVAL**

○ *Report Weapons Locations:* Whenever hostile air defense weapons are located, they should be reported to your unit operations section or to the support unit. This includes those weapons which are engaged and destroyed and information of these systems detected through radar warning receiver equipment. Reported information is introduced into the intelligence system and transmitted to all aviation units. When this information is processed with other reports, the air defense posture and other data about the enemy can be determined. Knowledge of the location of hostile air defense weapons is the first step to survival on the battlefield.

FUTURE TRENDS

○ *Advanced Weapons Systems:* Under testing and development for the present AH-1 and future AAH is the Hellfire missile system. In general, the Hellfire is an advanced missile system with extended range capability utilizing either airborne or ground laser designators as a guidance means for the missile, once launched. This missile system will enable greater standoff ranges, better and more lethal firepower; and it will decrease exposure time significantly. Also under testing and development is an improved 30mm gun system with armor-penetrating capability and extended range.

○ *Radar Jammers:* Radar jammers would give the pilot the capability to jam enemy radar-guided weapons and weapons systems. For use against enemy air defense artillery radar systems, the radar jammer would act as a temporary

countermeasure to buy time to maneuver, mask, or complete engagement of the threat ADA system. *Caution: It must be remembered that the ZSU-23-4 and S-60 are capable of radar and optical engagement modes or combinations thereof.* It only takes seconds to switch from the radar mode to an optical mode. The advantage of a radar jammer then would be twofold: (1) Buy time and (2) degrade the range effectiveness of the system. The radar jammer would be used in conjunction with the aircraft radar warning receiver.

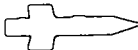
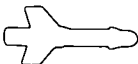
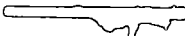
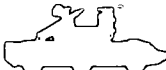
● *Chaff:* Chaff is a passive radar jamming device. Chaff is millions of tiny metal or metal-coated fiberglass strips cut to one-half wave lengths of specific radar frequencies. Chaff reflects the radio frequency (RF) energy transmitted by the radar system and causes false targets or clutters the radarscope of the enemy ADA weapons system. Chaff can cause radar break-lock or confuse the operator with respect to the location of the actual target. Chaff then serves both as a decoy or jamming device. It is a temporary countermeasure used to deceive the enemy of your true intentions or to buy time to maneuver, mask, or complete engagement of enemy ADA systems. Chaff would also be used in conjunction with the aircraft radar warning receiver. Two systems currently undergoing testing and development are a 2.75-inch FFAR and a chaff dispensing system (XM-130).

**CHAFF IS BOTH A DECOY
AND A JAMMING DEVICE**

THE AIR DEFENSE MISSILE THREAT

Table 3 depicts the current air defense missile threat. Included in the table are the "SWATTER" and "SAGGER" antitank-guided missiles (ATGM). Although these missiles are not classified as true air defense missiles, it is believed they can be a threat factor for Army aircraft operating in contour or NOE flight regimes.

TABLE 3**AIR DEFENSE MISSILE THREAT**

WEAPON SYSTEM	RANGE AND CAPABILITY	ACQUISITION MEANS	ASSIGNMENT
SAGGER ATGM 	Wire-guided Slant Range: 3.0 km	Optical	Company, Man-portable or vehicle-mounted
SWATTER ATGM 	Radio-guided Slant Range: 3.5 km	Optical	Company, Vehicle- or helicopter-mounted
SA-7 GRAIL 	Low-altitude, AD missile Slant range: 3.5 km	Optical	Company, man-portable
SA-9 GASKIN 	Low-altitude, AD missile Slant range: 7 km	Optical	ADA battery of motorized rifle and tank regiments
SA-8 GECKO 	Low-altitude, AD missile Slant Range: 10 km to 15 km	Radar	Antiaircraft regiments of some motorized rifle and tank divisions
SA-6 GAINFUL 	Low-altitude, AD missile Slant range: 30 km	Radar	Antiaircraft regiments of some motorized rifle and tank divisions
SA-3 GOA 	Low- to -medium altitude, AD missile Slant range: 24 km	Radar	Army
SA-4 GANEF 	Medium-to-high altitude, AD missile Slant range: 70 km	Radar	Army
SA-2 GUIDELINE 	High altitude, AD missile Slant range: 40 km	Radar	Army

The SAGGER and SWATTER antitank-guided missile systems are employed with leading tank elements of the motorized rifle or tank battalion. Normally, they are mounted on the BMP personnel carrier or BRDM reconnaissance vehicle. The "suitcase" SAGGER is a man-portable system that can be remoted 15 meters away from the launcher. The vehicle-mounted version (BRDM) can be remoted up to 80 meters. The SWATTER ATGM can be helicopter-mounted on the HIND A and D models. The primary role of SAGGER and SWATTER is antitank, but they can be a threat to helicopters operating at NOE and contour flight levels.

EMPLOYMENT TACTICS AND TECHNIQUES

The SA-7 GRAIL and SA-9 GASKIN are both infrared heat-seeking missiles that represent the most immediate battlefield missile threat to Army aircraft. The SA-7, similar to the US Redeye missile, is employed in all echelons of the threat offense and defense. It is a shoulder-fired missile, capable of contour flight level acquisition and lock-on. NOE flight level acquisition and lock-on are dependent on vegetation and terrain relief. The SA-9 is a vehicle-mounted (BRDM-2) missile much the same as the SA-7, but longer and heavier with greater range. The SA-9 is usually employed in a platoon (4 ea) in the main body of first and second offensive/defensive threat echelons. It is usually employed 1 kilometer to 2 kilometers to the rear of ZSU-23-4 antiaircraft gun systems in a complementary role. *Note: SA-9 can be fired in salvo.*

**BOTH THE SA-7 AND THE
US REDEYE MISSILE
ARE USED IN ALL
ECHELONS OF OFFENSE
AND DEFENSE**

The SA-8 GECKO is a vehicle-mounted, command radar-guided missile system. Each vehicle carries four missiles and is equipped with an acquisition and tracking radar plus two guidance radars. It also contains an electro-optical tracker—probably television. The US counterpart is the Roland. The SA-8 will be primarily deployed well forward with maneuver regiments. It is also employed as air defense for regimental/division command posts (CP) and in trains areas to the rear of the main battle area. The SA-8 will eventually replace the current S-60 air defense system. The SA-8 can acquire and lock onto Army aircraft at low-level flight levels and perhaps down to contour flight levels within its range capabilities depending on vegetation and terrain relief.

The SA-6 GAINFUL missile battery consists of a tracked-vehicle loader and several tracked-vehicle launchers with three missiles each. The US counterpart is the Hawk missile. The SA-6 is an Army-level air defense weapon that can be employed downward, as necessary, to protect maneuver regiments, CPs, supply areas, and other installations from the low-altitude air threat. It has the capability to acquire and lock onto Army aircraft in low-level flight regimes and above.

The SA-3 GOA is a two-stage, solid-fuel missile with a command radar-guided missile system. Two ready missiles are transported on each truck launcher. Each truck launcher also serves as a loader. The SA-3 is an Army area system used in a variety of roles ranging from battlefield support to barrier and terminal defense of rear area targets. It is not a threat to Army aircraft operating below 1,000 feet above ground level (AGL).

The SA-4 GANEF battery has one Pat Hand fire control radar-tracked vehicle, one tracked-vehicle loader, and three tracked-vehicle launchers with two missiles each. There is no US counterpart. The SA-4 is an Army area air defense missile system deployed well to the rear of division-level organizations. It is designed to protect large areas from the medium-to-high altitude air threat. It is not a threat to Army aircraft operating in terrain flight regimes.

The SA-2 GUIDELINE battalion contains a Fan Song truck-mounted fire control radar, truck-loader vehicles, and six single, trailer-mounted missile launchers. The US counterpart is the Nike Hercules. The SA-2 is an Army area air defense missile system deployed well to the rear of division level organizations. It is designed to protect large areas from the medium-to-high altitude air threat. It is not a threat to Army aircraft operating below 1,000 feet AGL.

SURVIVABILITY AND COUNTERMEASURES

■ ACTIVE COUNTERMEASURES

● *Suppression of ATGM:* ATGM systems are optically dependent guidance systems. Therefore, suppression on or near these systems can cause the guidance operator to lose track of the missile and miss the target. Remember, ATGM systems can be remoted away from the launcher. Suppress the

operator, not the missile. Smoke can deny visual acquisition and guidance, thus effectively removing ATGM systems from the battlefield temporarily. Factors and considerations for the use of smoke are provided in chapter 8.

● *Suppression of Infrared Missile Systems:* Current threat infrared missile systems are also operator dependent for visual acquisition prior to firing. Suppression can cause the operator to take cover or degrade his sighting capabilities. However, because the SA-7 is man-portable, and because the operator will probably take a rear angle shot at the aircraft to increase hit probability, you may not get a chance to suppress or even see the operator or missile. Therefore, during combined arms operations, Army aviation will be dependent on combined arms area suppression of man-portable systems for the most part. The SA-9 is vehicle-mounted, and will be much easier to identify and suppress. Smoke can also be effectively used to deny infrared missile operators visual acquisition of Army aviation assets temporarily.

THREAT INFRARED
MISSILE SYSTEMS
DEPEND ON VISUAL
ACQUISITION

● *Suppression of Radar Dependent Missile Systems:* Threat radar dependent missile systems are soft targets, and as such, are vulnerable to suppression by fire. If the radar(s) is damaged or destroyed, the missile system is ineffective. Time or variable-time (VT) fuze action, in conjunction with high-explosive artillery munitions, would be particularly effective against systems of this type. Chapter 8 contains factors and considerations for the use of field artillery suppression. *Note: Radar dependent threat missile systems are not affected by smoke.*

■ PASSIVE COUNTERMEASURES

● *Utilize Terrain Flight Techniques:* NOE flight techniques can be effectively used to the advantage of Army aviation assets against threat ATGM, radar, and infrared missile systems by helping to avoid detection. The SAGGER ATGM is wire-guided and will have trouble being guided through vegetation. Maneuver and masking can effectively degrade the capabilities of both the SAGGER and SWATTER ATGM as they are both optically guided. Against the SA-7, NOE flight in vegetated areas causes lock-on problems for the missile system. Masking can effectively degrade the capabilities of both the SA-7 and SA-9. The most

effective survivability countermeasure against threat radar dependent weapons systems is terrain flight techniques. This is because through the use of low-level, contour, and nap-of-the-earth flight, the aviator can avoid detection. For helicopters utilizing terrain flight techniques, the only real radar-guided threats are the SA-6 and SA-8. The SA-6 can be avoided by flying NOE. The SA-8, however, could be a problem even at NOE flight levels depending on range.

**STANDOFF IS NOT
A FACTOR AGAINST
THREAT RADAR
MISSILE SYSTEMS**

● *Employ Standoff:* Standoff can be effectively employed against threat ATGM and infrared missile systems. However, the SA-7 man-portable infrared missile system may be employed in unsuspected ambush sites and is hard to detect in any case. Therefore, standoff alone cannot be completely relied upon. Against threat radar missile systems, employing aviation assets at standoff ranges, in conjunction with altitude limitations, is the most effective means of survival for Army aviation fixed-wing assets. Generally, for helicopters, except in division/corps rear areas, standoff is not a factor against threat radar missile systems. For the most part, helicopters will be employed forward well within range capabilities of threat radar air defense missile systems. The key to survival in this situation is to operate at altitudes under threat radar systems capabilities.

● *Utilize the Aircraft Radar Warning Receiver:* The aircraft radar warning receiver indications must be monitored to determine when to mask or maneuver. Remember, upon indications of being tracked, time is running short for evasive action.

● *Minimize Exposure Time:* If it is necessary for Army aviation assets to operate at altitudes and ranges within the capabilities of threat air defense missile systems, it is imperative that exposure times be limited to acquisition/engagement time capabilities of threat missile systems or dependent on aircraft radar warning receiver indications. In this manner, Army aviation assets can descend to safe altitudes or mask prior to missile firing. For helicopters using masking techniques, missile time of flight can also be figured into the problem as the missile cannot track a masked target.

● *Reduce the Aircraft Signature:* In general, reduction of the aircraft signature for helicopters operating at terrain flight levels can be achieved by being aware of the surrounding environment as previously discussed in this chapter. Against threat ATGM, presenting the missile operator with the smallest target is effective. Against threat infrared missile systems, the angle, the heat cross-section presented, and the weather may be important factors. Against threat radar missile systems, the radar cross-section presented by the aircraft can be reduced.

■ SPECIAL CONSIDERATIONS FOR FIXED - WING MISSIONS

The missions against which the fixed-wing aircraft will be allocated can be broken into two general types—standoff and penetration. Although both missions entail distinct dangers, the penetration is far more difficult and probably of much higher priority. But standoff will be used far more frequently.

**FIXED-WING AIRCRAFT
ARE USED FOR
STANDOFF AND
PENETRATION
MISSIONS**

● *Long Range Standoff Missions:* Standoff missions will be used for long-range surveillance using side-looking airborne radar and for signal intelligence collection. These missions normally will be flown at altitude at an approximate range of 30 kilometers (km) behind the forward edge of the battle area (FEBA). The distance behind the line-of-contact or FEBA will improve aircraft survivability by reducing the number of enemy aircraft (range factor) and through support by friendly electronic warfare (EW) elements.

Crew preparation includes filing of flight plans, obtaining communications data, and planning for evasion of enemy missiles, anti-aircraft weapons, and interceptors. During preflight planning, you must plot the locations and fire fans of all known missile positions which could engage the aircraft during its mission. You must then plan methods of evading each missile should it be launched against you. Evasive maneuvers must be planned to take advantage of protective terrain in the area. EW support should be planned for use whenever the radar warning receiver indicates particularly threatening hostile air defense activities.

As you fly the mission, you must stay alert and keep your eyes open, especially where your threat display is concerned. If you receive a threat indication, immediately look in that direction and be prepared to go for the deck. Now, here is where your planning comes into play. Is this a radar that you already know about, or is it a new one? If it's a new one, report it immediately; if it's a known one, then simply note direction, time, and duration and include it in your postflight brief. *You should not abort your mission at this point.* Watch your radarscope and indicator panel. If you get missile readiness indications, then you should be ready to head for the deck. Check the terrain below. If you have to get down, know where you are going to go. In North Vietnam, the enemy often used the trick of turning on missile radars to cause the Air Force to drop their ordnance and thus, in effect, abort the mission. If you get the final indication, then head for the deck; and, if possible, put some high terrain between you and the missile site.

CAUTION

If you are on an instrument flight rule (IFR) or night mission, do not execute any inverted maneuvers or you will end up doing the enemy's job for him. Nose over and descend rapidly.

Do you quit and go home? Not yet. Remember, the information you are getting is important—if it were not, the enemy wouldn't be wasting missiles on you. If the radar and missile sites are known ones—ones you had previously considered in your planning—then fly out of the fan you had plotted, climb back to altitude, and resume the mission. Don't forget to report the missile firing and to check in with air traffic control on your change in route. Nothing was said about visually locating the missile at and after launch. In the standoff mission, you normally will be at the far end of the missile fan. This means that the launch site could be 20 to 30 nautical miles away from you; and with the normal battlefield fires, it may be difficult or impossible to detect. Obviously, you are going to try to pick it up; and if either crewmember can, so much the better, because you will know in which direction to dive.

PENETRATION MISSIONS ARE OPERATIONS AT AND BEYOND THE FEBA

● *Penetration Missions:* The fixed-wing penetration mission is the other type that you will be concerned with; and it is, by far, the most difficult and dangerous. Unlike standoff

missions, you are now concerned with operations at and beyond the FEBA. You will be flying into a field of weaponry that ranges from pistol fire to the most sophisticated missile and airborne interceptor systems in the enemy's inventory.

Even with the dangers presented by a penetration mission, there is distinct probability that such a mission must and will be flown. The ground commander must have current intelligence in a fluid battlefield situation. This intelligence must not only be current, but it must be specific and accurate as well—intelligence that will show the vulnerabilities of an enemy. Therefore, in spite of everything, you must be prepared to go in and get the information. The success of the mission and whether or not you come back depends on how well you prepare.

Now, how do we accomplish such a mission? Certainly, you must thoroughly evaluate the enemy. Once again, gain and use knowledge of the enemy's weapons, tactics, and situation.

Fly as low as possible using contour flight to take advantage of available cover and concealment afforded by the terrain, thus eliminating a great deal of the enemy's ability to visually observe or detect you by radar. Be prepared to make use of every evasive action at your disposal. *Never set up a pattern; always use different routes and target approaches!*

If the target area to be covered is too large for one low pass, use more than one aircraft, with all making one—and ONLY ONE—pass at the same time over the target. Keep the number of aircraft to a minimum; the more aircraft used, the more easily detected. After passing the target, get back down on the deck.

Consider the following: If you can accomplish a penetration mission by visual means with panoramic camera backup, then by all means do it. You'll be able to stay on the deck throughout the flight because your "pan" camera can produce good results at your lowest altitude. Use of the infrared sensor and frame camera requires you to pop up and pass over the target at a higher and more vulnerable altitude. Let's not do this if we can avoid it.

**PLAN YOUR MISSION
ROUTE TO AVOID AS
MUCH OF THE ENEMY'S
AIR DEFENSE
AS POSSIBLE**

Maintain a complete understanding of the friendly situation and available support. All this information is prerequisite to planning and conducting a successful penetration mission.

A mid-intensity or high-intensity threat dictates that suppression of enemy air defense weapons be maximized.

**USE SUPPORT FROM
EVERY AVAILABLE
SOURCE TO COMPLETE
YOUR MISSION**

Artillery, tactical air support, and electronic warfare support must be obtained from every available source to insure mission accomplishment.

Request preplanned artillery and tactical air support to suppress enemy strongpoints and known air defense positions along your mission route. Consider the use of smoke to screen your operations. Perhaps an air-delivered chaff corridor can be used to get to the target area. Make arrangements to have artillery or tactical air on-call for suppression or cover as needed.

You would be wise to anticipate delays or even nonavailability of requested suppressive support due to higher priority requirements. Have an alternate course of action ready.

Request the jamming of radars and enemy air defense communications through the G2 tactical surveillance officer. Since this could involve both Army and Air Force assets, detailed coordination is necessary. However, this is not your problem—pick out radars that are most dangerous to your mission profile and request assistance.

**PLAN YOUR MISSION
TO TAKE ADVANTAGE
OF EW SUPPORT**

Find out when other operations will be conducted using electronic warfare support; when feasible, plan your mission so that this electronic warfare support serves your needs as well. Whenever a mission can be flown in conjunction with other operations, do so; this will dissipate the enemy's effort. If a tactical airstrike is planned, this should divert some enemy air defense capability. Time your flight to take advantage of this distraction.

You will be flying your mission using contour flight, so plan it that way from takeoff until you are back home. Find an identification point that is in friendly territory and easily

identified; use it as a coordination point to start your mission. Pick readily identifiable checkpoints 2 minutes to 5 minutes apart. These are a must to keep you oriented, on course, and provided with a coordination point for fire support. Maintain flight-following with air traffic control, and report crossing each checkpoint. Terrain masking will limit your use of onboard radios except high frequency; if high frequency is available, use it. If not, use a prearranged relay aircraft or an airborne controller. Remember to use communication security; and be brief, or the enemy will be provided data to track you with. The use of all these measures will minimize crew and aircraft vulnerability throughout the mission.

**MAINTAIN FLIGHT-
FOLLOWING WITH
ATC AND REPORT
CHECKPOINT CROSSINGS**

Find out if other aircraft will be in the area. If so, can you use them in support of your mission? Can they cover you if you get into trouble and can they pick you up if you need to eject?

At this point, you are ready to start your mission. Conduct a thorough preflight check of your aircraft survivability equipment in addition to your aircraft and systems. Review your mission notes for information on how to call for suppressive fires and jamming support. Look over your map, noting checkpoints, time, and distance marks. Miss your checkpoints or time and you might fly into your own fire support. If you do, you need not worry about the hostile air defense threat.

As you take off, remember the capabilities of enemy warning radar and stay low to avoid detection. Fly to your identification point and cross it at the planned time. Turn your identification, friend or foe (radar) (IFF) off as you cross the FEBA to prevent enemy interrogation of your transponder. The mission is now on its way.

**STAY LOW AND
USE ALL YOUR
NAVIGATION AIDS**

Stay low and use all your aids to navigation from initial navigation system (INS) to dead reckoning—remember, there is no climbing to get your bearings! Keep track of your time at checkpoint; if you are early, lift any prearranged fire support a little early—do not loiter. Don't forget your warning receiver.

Keep an eye on it. If you receive a threat indication dead ahead, then you had better change direction; if it is off to one side, look for terrain to mask you. Is the indicated threat one you expected from a known radar/missile location? If so, you can use preplanned suppressive fires. *Watch out for wires!* Even in peacetime, we aviators are vividly aware of the wire hazard during contour/low-level flight. In combat, the enemy can be expected to supplement existing telephone lines and powerlines by stringing cables across likely avenues of flight.

Keep your photo and infrared systems ready for operation. Conduct the flight as a visual reconnaissance mission, noting any activity along the way. Report significant sightings immediately; take notes on all activities and include them in your postflight debrief. When possible, use your photo and infrared systems to record the activity. If you are not sure of what was seen, note what you can—do not go back!

**WAIT UNTIL THE
LAST SECOND BEFORE
CLIMBING TO TARGET
ALTITUDE, THEN CLIMB
ONLY ENOUGH TO
COVER THE TARGET**

As you approach your target, wait until the last second before climbing to target altitude; then climb only to the minimum altitude necessary to obtain target coverage. If you have obtained tactical air support against air defenses in the target area, make sure that they precede you in their attack. Make your target run after they have initiated their attack and before they leave the area.

**WHEN USING MULTIPLE
AIRCRAFT, SEPARATE
AFTER COMPLETING
ALL TARGETS**

Remain at contour/low-level flight to your next target to stay below radar coverage. After completion of all targets requiring multiple aircraft, separate. Go to other pinpoint targets or return to base.

What are you going to do if you run into trouble? If you draw fire and take hits, do you abort or continue? As always, the pilot makes the decision. Carefully weigh your problems against the courses of action. If you have passed the enemy's strongest resistance and are in no immediate danger of losing your aircraft, continue your mission.

If you missed your target, continue to the next target. Remember, the more we can cover on each mission, the less the requirement for further missions. After considering all this, if you determine that significant damage has occurred to aircraft or crew, you have no recourse but to abort. In doing so, immediately advise air traffic control and request assistance. Take the most direct route to a safe area as planned and keep air traffic control advised of your progress. Turn on your IFF as you approach friendly airspace.

○ *Antitank Guided Missiles*

FUTURE TRENDS

▲ Optical Suppressors

○ *Infrared Missile Systems*

▲ Infrared Jammers: Infrared jammers operate on the principle of inducing spurious signals into the threat missile guidance system, thus degrading the threat missile seeker section. Infrared jammers are designed for continuous operation; consequently, missile launch/approach detection is not required.

▲ Optical Suppressors

▲ Flare Dispensing System: Currently under development is a general-purpose chaff/flare dispensing system. Activation of the system would be on command from the aircraft missile launch/approach indicator sensings. The flares would act as decoys, confusing the infrared missile seeker and drawing it off-target.

▲ Exhaust Plume Suppressors: Under development and testing are exhaust plume suppressors for Army aircraft that reduce the heat output from the exhaust system and reduce the heat cross-section of the exhaust. This effectively reduces the infrared signature available.

▲ **Low-Reflective Infrared Paint:** Reflected sunlight from the aircraft skin, propeller, or rotor systems provides a heat source for infrared missiles. Under development and testing are low-reflective, infrared paint and patterns that will decrease reflected sunlight from aircraft.

▲ **Missile Launch/Approach Detector:** A missile launch/approach indicator would warn the pilot of missiles launched at the aircraft. The aircraft could be maneuvered to mask or the system would activate jamming or decoy systems.

● *Radar Missile Systems*

▲ **Radar Jammers:** Radar jammers will effectively reduce the influence of radar missile systems on the battlefield. Threat radar-directed missiles—as we know them today—rely solely on radar for guidance. A radar jammer may operate in conjunction with radar warning receiver indications or independent in a transponder mode.

▲ **Chaff:** Chaff would be a temporary countermeasure to deceive the enemy of the aircraft's true intention, allow time to maneuver to mask, or allow time to complete engagement of the missile systems. Chaff would be dispensed, based on radar warning receiver indications and in conjunction with prescribed evasive maneuvers; or 2.75-inch chaff rockets could be fired at specific locations to screen maneuver or decoy the radar away from attack helicopters, so the missile systems could be engaged.

▲ **Radar Cross-Section Reduction:** Radar cross-section reduction refers to making the target appear smaller or reducing the target image that is projected on the enemy radar screen. This could affect the radar's range capability or render it ineffective when chaff decoys are dispensed.

SUMMARY

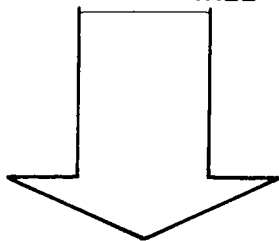
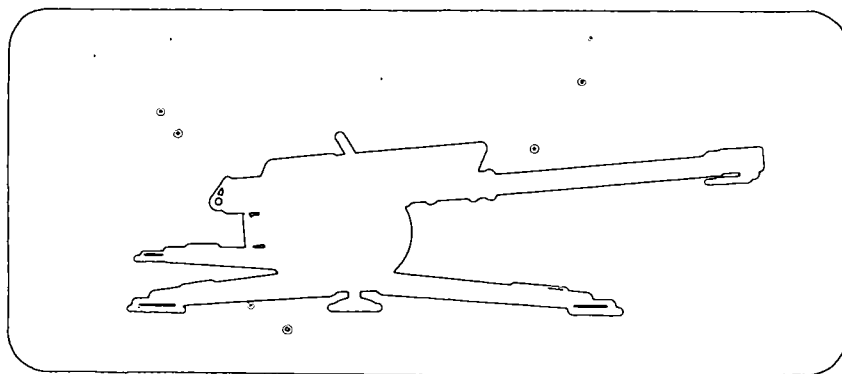
Now that we have discussed similar threat air defense systems on a case-by-case basis, let's put the whole spectrum into perspective to see how the principles of mass, mix, mobility, and integration are achieved through threat employment. Figure 2-3 shows the level of air defense weapons employment.

WEAPONS SYSTEM	COMPANY	BATTALION	REGIMENT	DIVISION	COMBINED ARMS ARMY
SA-2					X
SA-3					X
SA-4					X
SA-6				X	X
SA-8			X	X	X
SA-9		X	X	X	
SA-7	X	X	X	X	X
S-60			X	X	
ZSU-57-2		X (Tank)	X (Tank)	X	
ZSU-23-4		X	X	X	
ZPU-4		X	X	X	
SAGGER	X	X	X	X	
SWATTER	X	X	X	X	
14.5mm MG	X	X	X	X	
12.7mm MG	X	X	X	X	
Individual Weapons	X	X	X	X	

FIGURE 2-3. THREAT AIR DEFENSE WEAPONS EMPLOYMENT.

As emphasized throughout each countermeasures section of this chapter, NOE flight techniques coupled with combined arms suppression of the air defense threat are the two basic and most important countermeasures for aviation unit survival in the high threat air defense environment. The necessity for use of aircraft survivability equipment, for the most part by helicopters, will be dependent on how well we have applied the two basic countermeasures. For fixed-wing aviation assets, aircraft survivability equipment is more important for survival. Although the use of these countermeasures appears simple on paper, their application and success in the final analysis will reflect the utilization of the "Principles of Success" as outlined in chapter 1.

CHAPTER THREE

SURVIVAL
OF THE ARTILLERY
THREAT**THE ARTILLERY THREAT**

Since World War II, threat forces have relied increasingly on massed quantities of artillery. Threat artillery support is characterized by area saturation in massive barrages known as the artillery offense. The concept employs severe and intense bombardment by a multiple assortment of artillery mortars, howitzers, guns, rockets, and missiles to defeat the enemy with minimal use of foot and mechanized troops. Threat forces are equipped with a variety of excellent artillery weapons capable of firing conventional, nuclear, biological, and chemical rounds.

Given the threat doctrine, artillery area saturation could well be the most formidable threat to US Army aviation units operating in the nap-of-the-earth (NOE) environment.

Threat artillery is combat organized at front, army, division, and regimental levels by combining organic assets with assets from higher headquarters. Nonorganic artillery support is provided by the army artillery regiment of the tank and combined arms army and by the artillery division or heavy artillery brigade attached to the front. Each echelon of command retains its own organic artillery support, but may be assigned additional artillery support from the next higher headquarters. For example, each division within a combined arms army has its own organic division artillery; the combined arms army has its own organic artillery regiment, parts of which may be assigned to a division; and the front has its own organic artillery division, parts of which may be assigned to a division. The artillery regiment normally consists of three artillery battalions. The artillery division usually consists of nine artillery battalions. The heavy artillery brigade consists of one battalion of 180mm guns and one battalion of 240mm mortars. Table 4 gives a breakout by caliber, assignment, quantities, and normal offensive/defensive deployment distances behind the forward edge of the battle area (FEBA).

EMPLOYMENT TACTICS AND TECHNIQUES

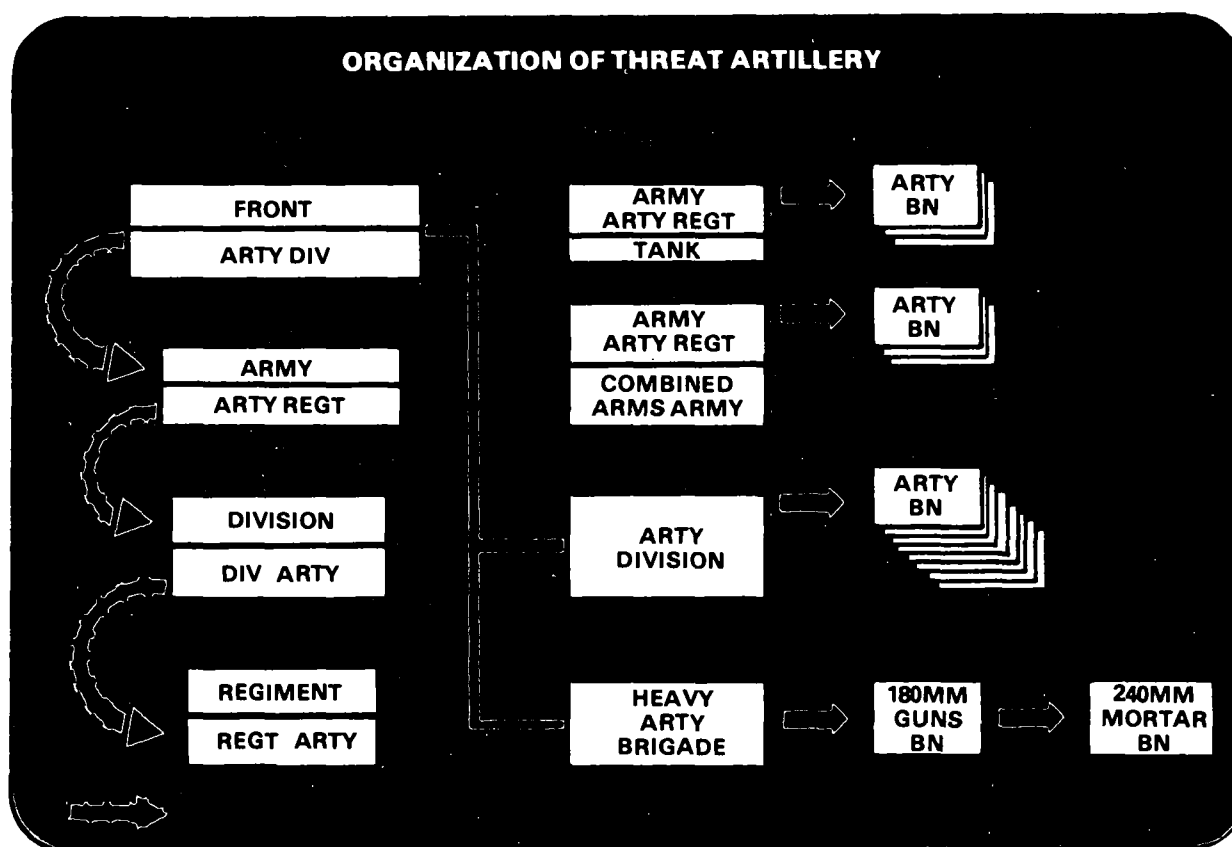


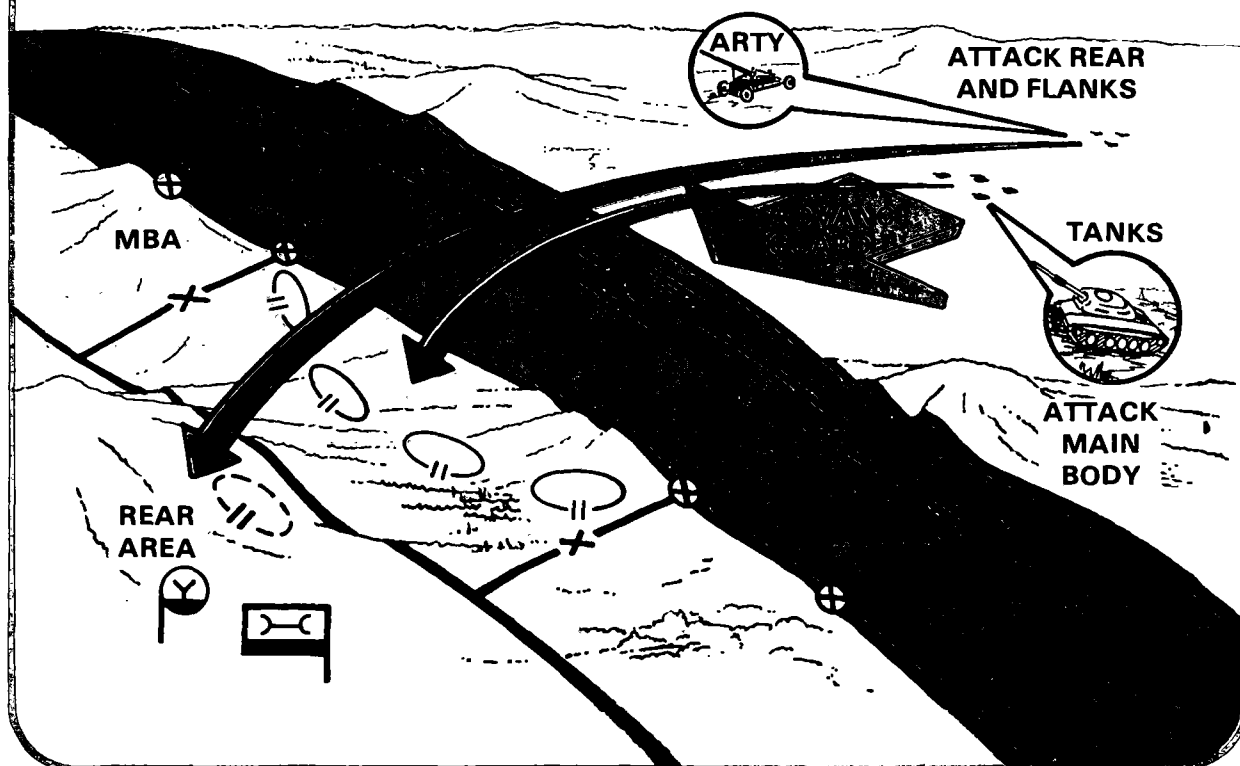
TABLE 4**THE ARTILLERY THREAT**

WEAPON	MOTORIZED RIFLE BATTALION	TANK/MOTORIZED RIFLE REGIMENT	TANK & COMBINED RIFLE DIVISION	ARTILLERY REGT OF HEAVY ARTILLERY BRIGADE OF FRONTS	ARTILLERY DIVISION OF FRONTS		NORMAL DISTANCE BEHIND FEBA (KILOMETERS)	
							OFFENSE	DEFENSE
M1943 120mm Mortar	6	18	18/54				.5 to 1.5	.5 to 1.5
D30 122mm Howitzer*		6	60/54				.5 to 4	2.5 to 5
M1974 122mm Gun/Howitzer							.75 to 6	6 to 10
BM21 122mm Multiple- Rocket Launcher			18 launchers				.5 to 6	2.5 to 10
D1 152mm Howitzer*			0/18				.5 to 4	2.5 to 5
D20 152mm Gun/Howitzer				18		54	.5 to 6	2.5 to 10
M1973 SP 152mm Gun/Howitzer							.5 to 6	2.5 to 10
M46 130mm Gun				36		72	.5 to 4	2.5 to 5
S23 180mm Gun					18		.75 to 6	6 to 10
240mm Mortar					18		1 to 3	4 to 6
FROG 7 Free- Rocket-Over-Ground			4 launchers				8	15

*The self-propelled (SP) version may be substituted for the towed version.

OFFENSE: The first elements to establish contact with US covering forces may be clearing force (advance guard) units of divisional forces as previously discussed in chapter 2. The advance guard, either a reinforced motorized rifle or tank battalion, in contact with an undeployed enemy force, will attempt to overrun the forward enemy units while tanks attack the enemy main body, and artillery attacks the rear and flanks. Every effort is made to split the enemy column, destroy isolated elements, and attack the enemy from the rear. On contact with a deployed enemy, the advance guard attempts to destroy him. However, if not immediately successful it attempts to locate the enemy flanks while the main body deploys. The main body attacks with the least practicable delay and this attack is supported by all available aircraft and artillery, to include nuclear fires if allocated. A hasty coordinated attack from the march can be made by division size units within 5 to 6 hours. If the attack of the advance guard is stopped and the enemy counterattacks, the advance guard holds sufficient ground to cover the deployment of the main body. If this fails the main body deploys on the nearest suitable terrain and planning for a deliberate attack is started.

The advance guard is normally reinforced with engineer, chemical, air defense and artillery units. In some instances even attack helicopters, armed with antitank-guided missiles, rockets, and guns may accompany the advance guard. Once contact is made with an enemy force, the advance guard may even employ smoke to cover its movement into battle formation.



○ **DEFENSE:** As previously discussed in chapter 2, the deliberate defense is organized in successive belts designed to provide depth to the defended area. At FRONT and Army level the defense consists of a security zone, a main defense belt, a second defense belt and a third defense belt. Within these belts, divisions defend in echelons. The defensive posture of a first echelon motorized division, for example, would consist of a security zone, a first echelon, a second echelon and a reserve. Artillery is included in all echelons and belts of the defense and is deployed as far forward as possible.

Artillery fires in support of defensive operations are planned with five considerations in mind:

- ① **Long-range fires** - *planned against enemy troop concentrations to disorganize exposed forces and reduce their ability to fight.*
- ② **Massed fires** - *planned on enemy assembly areas, tanks, command posts, and artillery prior to their attack.*
- ③ **Barrage fires** -
- ④ **Final protective fires** - } *planned in front of the FEBA and throughout the main battle position.*
- ⑤ **Direct fires** - *used against tanks and mechanized infantry that have broken through the forward defenses.*

Artillery is essential to the success of the breakthrough. In the conventional version of the breakthrough, concentrated preparation is carried out lasting from thirty minutes to an hour or longer. The goal is to achieve total neutralization of the defending enemy units and artillery in the breakthrough sector. Artillery fires in the breakthrough areas will be concentrated with up to 100 tubes per kilometer. Artillery, rockets, mortars, 100mm antitank guns, and tank guns may be used to achieve this density. Threat forces emphasize the use of preplanned, massive, indirect artillery fires mainly due to the inflexibility of the fire control channels of the command structure. Immediate fire support is provided by utilization of artillery and tanks in direct fire modes to overcome heavily defended positions which cannot be immediately overcome or threaten to slow the attack momentum.

The threat considers the pursuit an offensive operation designed to complete the destruction of the enemy. Planning for the pursuit is begun before the attack. Plans include consideration of possible withdrawal routes, composition of pursuit forces, and preparation of maneuver best suited to the situation. Rather than follow a retreating enemy, threat units move along routes parallel to the enemy's retreat, attempting to outdistance elements of the enemy force, cut the withdrawing columns into segments, and destroy them. Helicopters may be employed to locate and engage retreating units and guide pursuing forces into contact. Airborne, airlanded, and airmobile forces may be used to control critical terrain and block or slow down the enemy's withdrawal. Artillery will be used extensively to cut withdrawing forces into segments and to block, canalize, and destroy them.

There are several inherent weaknesses common to threat artillery that can be exploited by Army aviation units to enhance survivability. In addition, Army aviation has some inherent characteristics that, if utilized, can enhance survivability.

SURVIVABILITY AND COUNTERMEASURES

■ ACTIVE COUNTERMEASURES

⊗ *Suppress Enemy Artillery:* Threat artillery, for the most part, is towed. Therefore, it does not provide good overhead cover for section personnel. Threat observation posts may or may not employ overhead cover. Threat helicopters used for directing/adjusting artillery fires are vulnerable soft targets. The nerve center for employment of indirect artillery fires is the fire direction center (FDC). It too is usually a vulnerable soft target. For the most part, we are going to have to rely on suppression of threat artillery systems by our own combined arms team and counterbattery artillery fires. However, if priorities allow, Army aviation assets cannot ignore the lethality of threat artillery as a potent means of firepower on the battlefield. Historically, artillery has been the greatest killer on the battlefield. Suppression by fire can neutralize exposed threat artillery crews, FDCs, and observers. Exposed threat artillery components would be particularly vulnerable to artillery fire utilizing variable time (VT) fuzing action in conjunction with high explosive shells. Chapter 8 provides considerations and procedures for the use of artillery/mortar fire. Attack helicopter 2.75-inch FFAR employed in direct or indirect fire modes would also be effective. If available, tactical air support would also be very effective (See chapter 8 for procedures).

**ARTILLERY HAS BEEN
THE GREATEST KILLER
ON THE BATTLEFIELD**

Enemy artillery ground observation posts are usually employed near the FEBA in positions that facilitate good fields of observation for the adjustment of artillery fires. Observation posts can be neutralized by fire suppression or by screening their vision with smoke. However, well camouflaged and well constructed observation posts may be difficult to detect and suppress by fire.

■ PASSIVE COUNTERMEASURES

● *Utilize Terrain to Your Advantage:* Because threat artillery doctrine emphasizes the use of artillery direct fire in breakthrough and fire support operations, most threat artillery weapons have been designed with a relatively low trajectory. Therefore, terrain masking offers the best passive countermeasure for helicopters operating in NOE flight modes. Good terrain analysis prior to and during combat missions will enable pilots to stay clear of likely artillery targets such as prominent terrain features, troop assembly areas, likely avenues of approach, massed infantry and armor units, friendly artillery units, trains areas, and command posts.

▲ Utilize flank and rear recon/firing positions and landing zones when possible.

▲ Maximize dispersal of aviation assets on the ground and in flight to minimize losses.

MOST THREAT ARTILLERY HAS A LOW TRAJECTORY

▲ Select primary and alternate recon/firing positions and landing zones to enable flexibility and protection from area artillery saturation.

▲ Insure premission planning includes detailed signals and procedures for execution of alternate landing/position changes.

▲ Utilize NOE and NOE flight techniques to avoid detection.

● *Exploit Mobility:* Threat artillery fires are planned and controlled at higher echelons of command and are less decentralized than US artillery. In addition, threat artillery doctrine emphasizes the employment of massive preplanned and on-call artillery support. Therefore threat inflexibility of shifting fires or obtaining artillery suppression of targets of opportunity is a weakness we can exploit by helicopter mobility.

⊕ *Utilize Available Intelligence Data:* The use of intelligence data can help the aviation unit to plan operations to avoid threat artillery.

● ***Report Intelligence Information Promptly:*** By reporting enemy artillery locations and type units you can provide information to identify and neutralize enemy artillery.

● ***Suppression:*** Under development is a remote control fuze setting capability for the 2.75-inch FFAR. This will give attack helicopter pilots the capability of selection of rockets/fuzes and remote setting capability of time fuzes as needed for direct and indirect fire suppression.

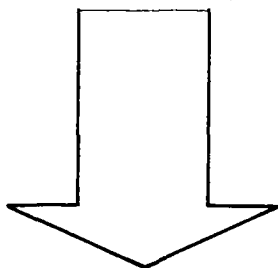
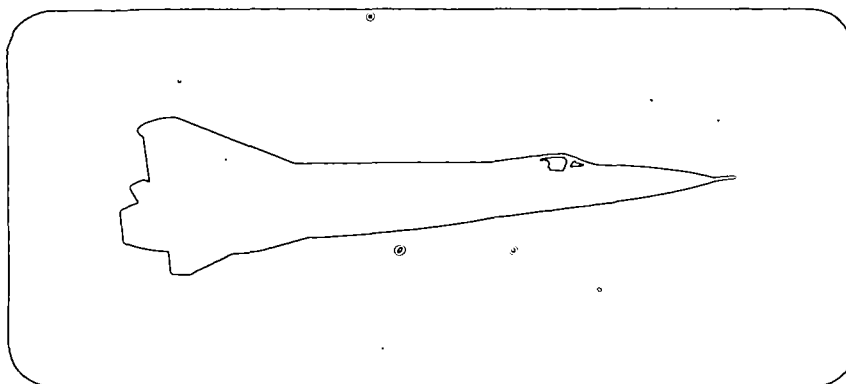
FUTURE TRENDS

● ***Optical Warning Laser Detector***

● ***Vulnerability Reduction:*** Vulnerability reduction packages for future generation helicopters have been discussed in chapter 2. These built-in features will also provide protection against artillery fragments.

SUMMARY

In order to perform their mission on the modern battlefield, Army aviation units and aviators will have to take into account the effects that threat artillery may have on the mission and plan accordingly to minimize the threat. In accomplishing this end, the aviator will have to utilize available intelligence resources, plan flight routes, positions, PZs and LZs to avoid likely artillery targets, remain flexible in implementation of the mission, use available suppression, and be an effective member of the intelligence reporting system. Threat artillery may not have top priority during the aviation mission, but it will be an awesome threat which will have to be suppressed by the combined arms team in order to accomplish the mission. Army aviation mobility plus the firepower of the combined arms team are the keys to success.

CHAPTER FOUR**SURVIVAL
OF THE TACTICAL AIR
THREAT****THE TACTICAL AIR THREAT**

The helicopter has taken its place among the organization of threat combined arms operations following the US success with troop transport and attack versions in the Vietnam conflict.

With increased mobility and sophisticated weaponry on the modern battlefield, threat forces have placed increasing emphasis on the role of tactical aviation in support of ground forces. This increase of threat tactical aviation support presents a serious survivability problem to the Army aviation unit assets operating on the battlefield. The actions we take when encountering threat aircraft will be clearly defensive. Survival will be dependent on our ability to avoid detection and to take evasive action. Engagement of hostile aircraft by Army aviation units will be only as a matter of self-defense.

THE HIGH PERFORMANCE AIR THREAT

The high performance threat consists of a variety of fighter/bomber aircraft generally represented by models in the FITTER, FENCER, FLOGGER, and FISHBED categories. Although their primary roles are not within the purview of fighter/helicopter engagements, they represent a significant threat by virtue of their firepower capabilities.

Threat tactical air forces are organized into tactical air armies at front level. Frontal aviation constitutes the bulk of the threat air force. Its roles are the tactical support of the land forces mainly by close air support and interdiction missions, as well as counter-air operations against hostile air forces on the ground and in the air. Threat aviation is assigned to Army units reflecting the close collaboration between frontal aviation and the land forces. Each air army is organized as depicted in figure 4-1 and includes its own electronic warfare and communications support.

EMPLOYMENT TACTICS AND TECHNIQUES

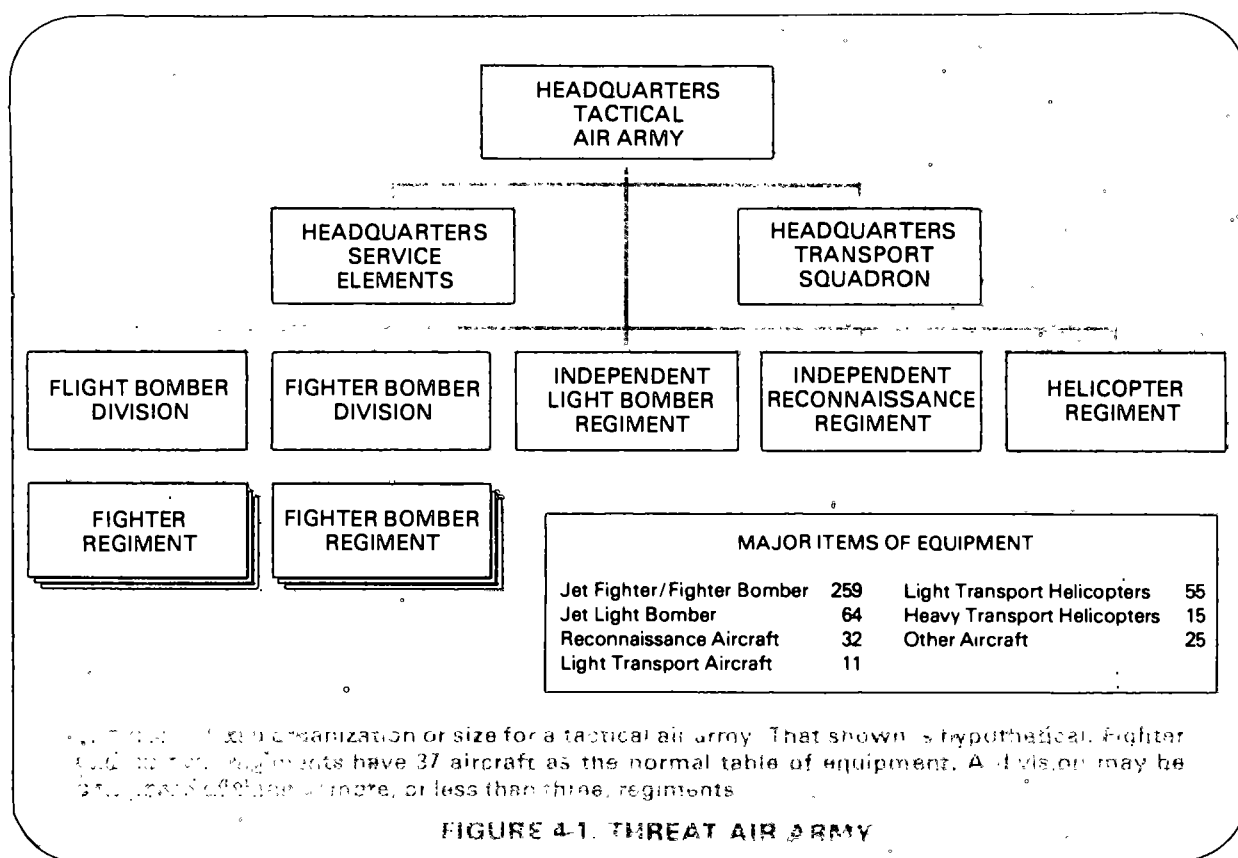
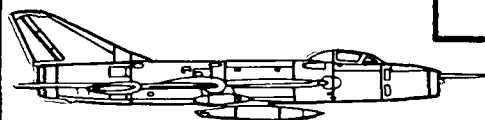


FIGURE 4-1. THREAT AIR ARMY

○ **OFFENSE:** Threat forces recognize that, initially, part of their air effort will be required to obtain local air superiority. Fighter units of the air army have the dual mission of providing air defense and close support for ground units. Attack and bomber units are used to:

- ① Engage targets beyond the range of artillery.
- ② Reinforce artillery fires on elected targets.
- ③ Provide immediate suppression of targets of opportunity.

Aircraft concentrate on enemy forward defenses immediately prior to infantry and tank assaults. The air attack supplementing the artillery fire is of short duration. Specifically, detailed artillery batteries neutralize enemy air defenses during the air attack.



SU-7B FITTER A
ATTACK

SU-19 FENCER A
LIGHT BOMBER



MIG-21 FISHBED
FIGHTER



Once the attack is launched, **bombers** attack enemy rear area installations; **attack aircraft** execute strikes against targets whose destruction or neutralization assists ground assault units; and **fighters** protect the bombers, attack aircraft, and ground units from enemy air attack.

○ **DEFENSE:** In support of the defense, threat air forces carry out the following specific missions:

- | | |
|--|-----------------------------|
| ▲ Destruction of nuclear or chemical capable weapons | ▲ Support of counterattacks |
| ▲ Airstrikes in close support of forces in contact | ▲ Reconnaissance |
| ▲ Attacks on concentrated forces | ▲ Counter-air |
| ▲ Attack of penetrations | ▲ Destruction of airbases |

Threat forces utilize the tactic known as "fire storm" in the defense to break the enemy attack. Close coordination between air forces and land forces is emphasized and is achieved through constant combined arms training exercises. During hostile offensive actions, supersonic jets flying in pairs survey the enemy forces and define their positions. Threat reconnaissance aircraft report by radio to the commander of the air force storm group. MiG-21 fighter bombers are immediately called into action to attack the main enemy assault effort. Bombs, rockets, and strafing fire hit the targets. The fighter bombers approach from all directions. Such an attack is designed to break up the antiaircraft defense forces and increase threat air attack effectiveness and survivability. At the same time, fighters make rounds over the battlefield in V-formation, providing air cover for the assault aircraft.

The last stage of the threat air force attack is the storm of Su-7 aircraft, carrying large bombs to provide area defensive coverage. Threat ground forces respond with ground-to-ground rockets, rocket artillery, guns/howitzers, and all armor-piercing means. "Fire storm" is conducted by all forces from all means. Antiarmor trenches and minefields are blown up on signal from the command post if the enemy attack has not been broken before reaching the forward edge of the defense.

If the enemy attack is broken, an immediate counterattack is launched by armor-heavy, second-echelon forces with air forces in support.

THE EIGHT ELEMENTS OF FIRE STORM

JETS FLYING IN PAIRS
SURVEY AND IDENTIFY

REPORT BY RADIO TO
COMMANDER OF AIR
FORCE STORM GROUP

FIGHTER BOMBERS
CALLED TO ATTACK
ENEMY'S MAIN BODY

FIGHTERS PROVIDE
AIR COVER

LARGE BOMBER AIRCRAFT
PROVIDE AREA
DEFENSIVE COVERAGE

GROUND FORCES ATTACK
WITH ROCKETS, ARTILLERY,
AND ALL ARMOR-
PIERCING MEANS

TRENCHES AND MINEFIELDS
ARE BLOWN UP ON SIGNAL
IF ATTACK NOT BROKEN

IF ATTACK BROKEN,
IMMEDIATE COUNTERATTACK
LAUNCHED

SURVIVABILITY AND COUNTERMEASURES

As can be seen from threat tactical air employment organization and tactics, high-performance aircraft will be a prevalent factor on the high threat battlefield. Their presence and contention will not only be near the main battle area, but deep in rear areas near supply trains and installations. Therefore, we must be prepared at all times to meet this threat and survive. In fact, Army aviation static locations will be most vulnerable to threat tactical aircraft. The mobility of Army aviation, particularly helicopters, presents threat tactical aircraft a greater problem.

■ ACTIVE COUNTERMEASURES

● *Suppression:* Threat tactical doctrine currently does not stress high-performance aircraft flight operations below 150 meters above ground level (AGL). This is partly due to current US organizational numbers in air defense weapons and air defense weapons range, weather, and altitude limitations, but mainly due to the fact that tactical aircraft maneuverability effectiveness increases with altitude. Threat tactical aircraft flying in a low altitude envelope can be extremely vulnerable to suppression. The best suppressive countermeasure against high-performance aircraft is opposing high-performance aircraft.

THE BEST SUPPRESSION AGAINST A "FAST-MOVER" IS ANOTHER "FAST-MOVER"

For combined arms and air assault operations, friendly tactical air support will usually be preplanned by the task force commander through organic S3/G3 (Air) channels in connection with the USAF direct air support center (DASC) located at division/corps headquarters. In NATO terminology, the DASC is referred to as the air support operations center (ASOC). For planning, advisory, and control purposes, the USAF provides a tactical air control party (TACP) at brigade and battalion levels.

In addition to preplanned tactical air support, the TACP is responsible to the task force commander for immediate tactical air support. When requesting immediate tactical air support during combined arms operations, the supported maneuver battalion/brigade S3 (Air) must be contacted. When requesting tactical air support, the following must be included in the request: (1) Target description and situation, (2) target location, (3) desired results, and (4) latest allowable time for the tactical-air strike.

Suppression can also be provided by small arms and air defense artillery organic or assigned to ground maneuver forces. In order to lure attacking threat high-performance aircraft into friendly Hawk/Chaparral/Vulcan coverage envelopes and then request assistance, you must know—and have preplanned—the mission in light of this possibility. Chapter 8 provides considerations and procedures for air defense artillery support. In addition, all infantry, armor, artillery, and cavalry battalions/squadrons have Redeye missile teams organic to each line company, battery, or troop, plus organic small arms.

Aviation unit assets in static positions are extremely vulnerable to threat tactical aircraft. Therefore, organic small arms and, when organic, Redeye missile assets must be integrated into position area defense. When satelliting near corps, division, and brigade command posts, air defense artillery coverage may provide a degree of protection for aviation unit assets.

**INTEGRATE SMALL ARMS
AND REDEYE MISSILES
INTO POSITION
AREA DEFENSE**

The area air defense coverage plan should be checked at S3/G3 operations. When possible, forward area refuel/rearm points (FARRP) should be located near trains areas so maneuver unit air defense assets can provide a measure of air defense for aviation unit assets. When this is not possible, Redeye teams can be requested through operations.

**LOCATE FARRPs
NEAR TRAINS
AREAS**

When conducting isolated type missions such as reconnaissance and surveillance, aviation unit assets may have to rely solely on organic on-board weaponry, if available, for immediate suppression of the tactical air threat. However, this should be considered only as a last resort—after all evasive and passive countermeasures have failed.

☐ **PASSIVE COUNTERMEASURES**

○ *Nap-of-the-Earth (NOE) Flight Techniques:* Due to inherent design and flight characteristics of threat supersonic tactical aircraft and equipment, there are several weaknesses we can exploit by using NOE flight techniques. The speed, altitude, and cockpit visual limitations of threat aircraft make it very difficult to visually acquire aircraft that are camouflaged or operating at NOE flight regimes amidst

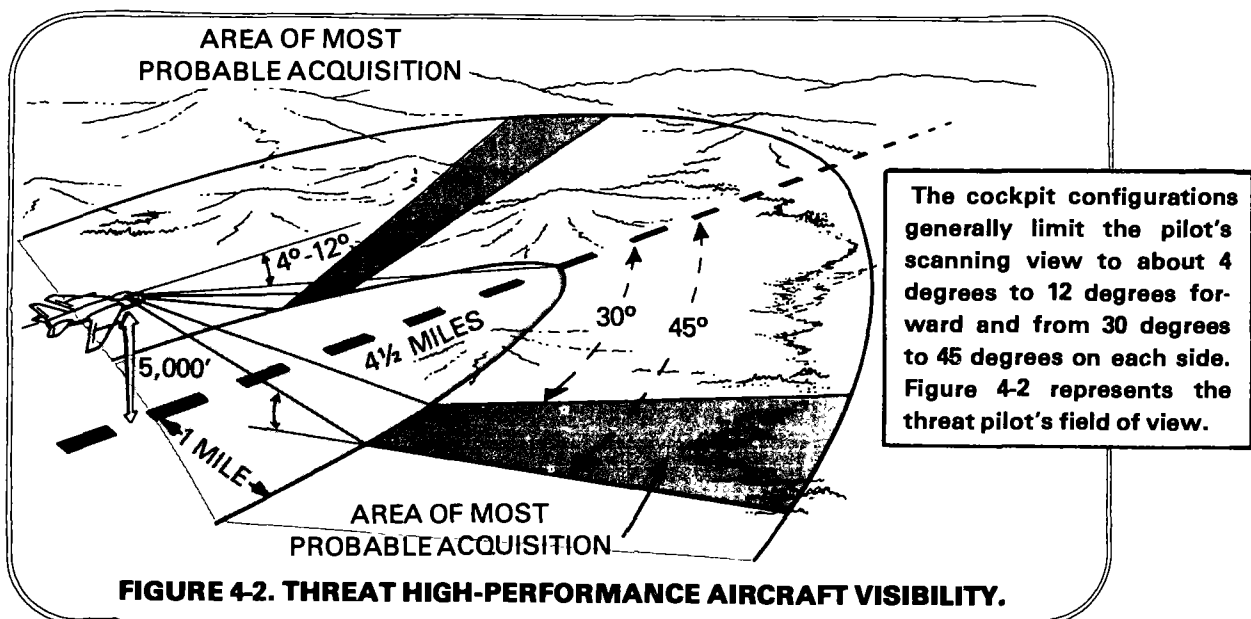
ground clutter. The faster the speed and lower the altitude of threat tactical aircraft, the smaller the chance of visual acquisition.

NOTE

Aircraft operating in open terrain, when paint color contrasts with terrain background, are easily acquired and engaged by high-performance aircraft. Avoid extended flight in open areas, if possible.

Ground clutter and NOE flight levels make it very difficult for threat tactical aircraft radar and infrared systems to acquire and lock onto aircraft in these flight regimes. For the most part, this equipment is designed for high-altitude, long-range target acquisition and interdiction. Maximum firing range for threat radar homing missiles varies from 6 kilometers to 11 kilometers, depending on type aircraft missile systems.

Currently, threat tactical aircraft rely almost solely on visual flight rules (VFR) flight in accomplishing missions. Therefore, the majority of the threat pilot's attention is going to be spent flying and navigating.



● *Considerations for Fixed-Wing Aircraft Operating at Altitude:* Fixed-wing aircraft operating at altitude must always be prepared to take action to avoid engagement by enemy fighters. Air traffic control will warn you of approaching hostile aircraft whenever possible. Normally, such a warning will include number of aircraft, location, altitude, direction, and possibly type. When you receive a warning, figure out which way to go to put as much distance as possible between you and him—*fast*. If he is fairly close to you, get down on the deck. This is a judgment area. If the enemy is 50 miles away and headed straight to the rear, you probably are not his target—after all, he has to worry about our air defenses and turning parallel to the forward edge of the battle area (FEBA) on our side would make him an ideal target. If he is only a couple of miles away, then you had better get down in a hurry. Stay on the deck and fly in valleys and between ridges as much as possible. Don't forget to tell air traffic control what you are doing.

**AVOID ENGAGEMENT
BY ENEMY FIGHTERS**

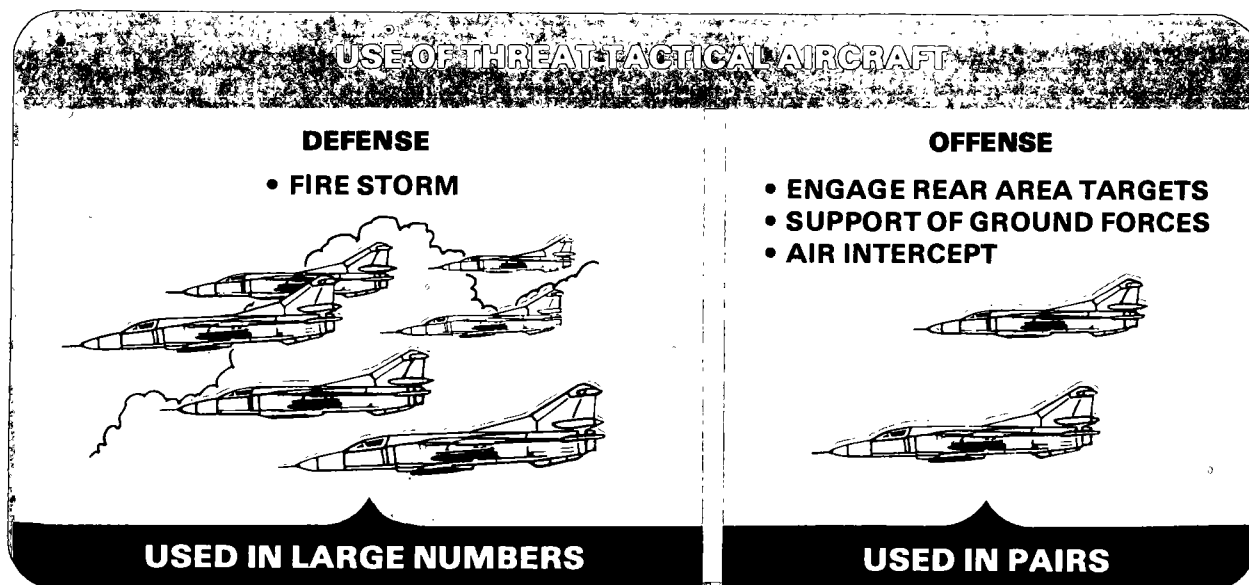
It would be best to remember your *hostile criteria*—do not conduct any maneuvers over friendly tactical units that could be mistaken as hostile actions. Redeye gunners and machine-gunners don't have identification, friend or foe (radar) (IFF).

There may be cases when the enemy is not picked up early enough for you to get a warning, and the first time you know he is there is when your threat display tells you that his airborne intercept radar is painting you. You have to act in a hurry—dive away from the threat and get down fast. As we mentioned in the planning phase, know where friendly air defense elements such as a Hawk or Chaparral/Vulcan are located. Once you are on the deck, head toward them. Be sure your IFF is on. On the way down, the copilot or sensor operator should try to visually acquire the enemy and notify air defense units in the area. If he is after you, your best defense is friendly air defense.

**IF A HOSTILE AIRCRAFT
IS AFTER YOU, DIVE AND
HEAD FOR FRIENDLY
AD ELEMENTS**

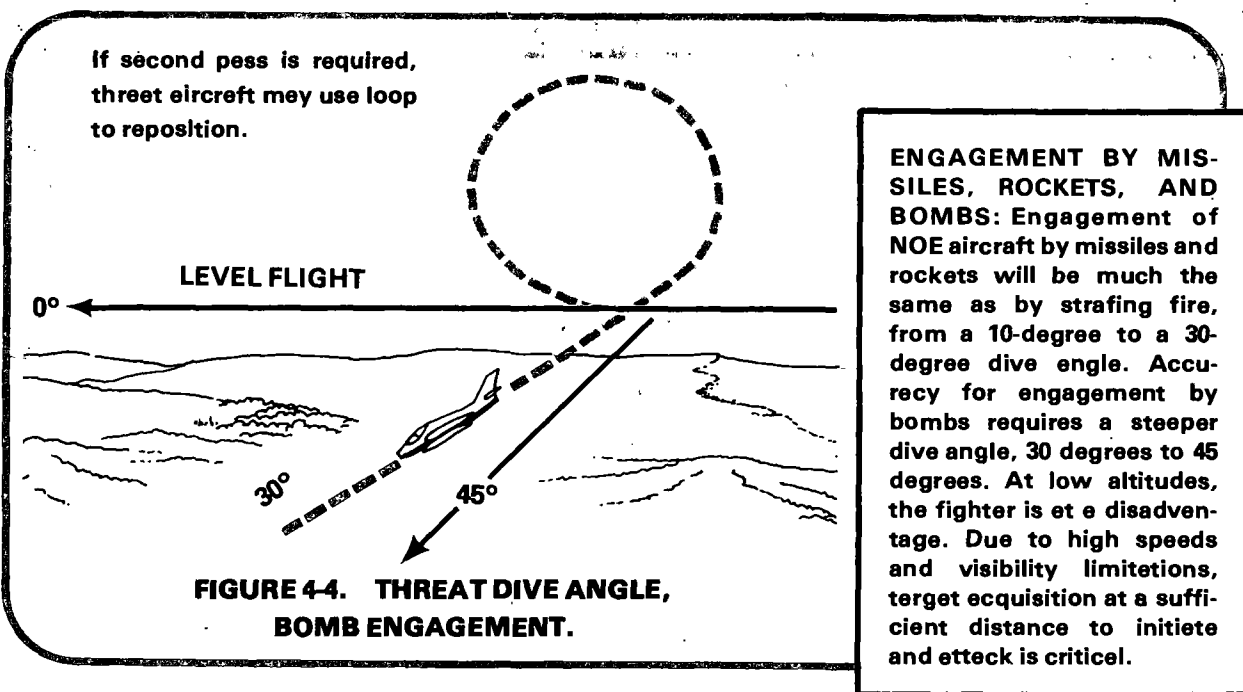
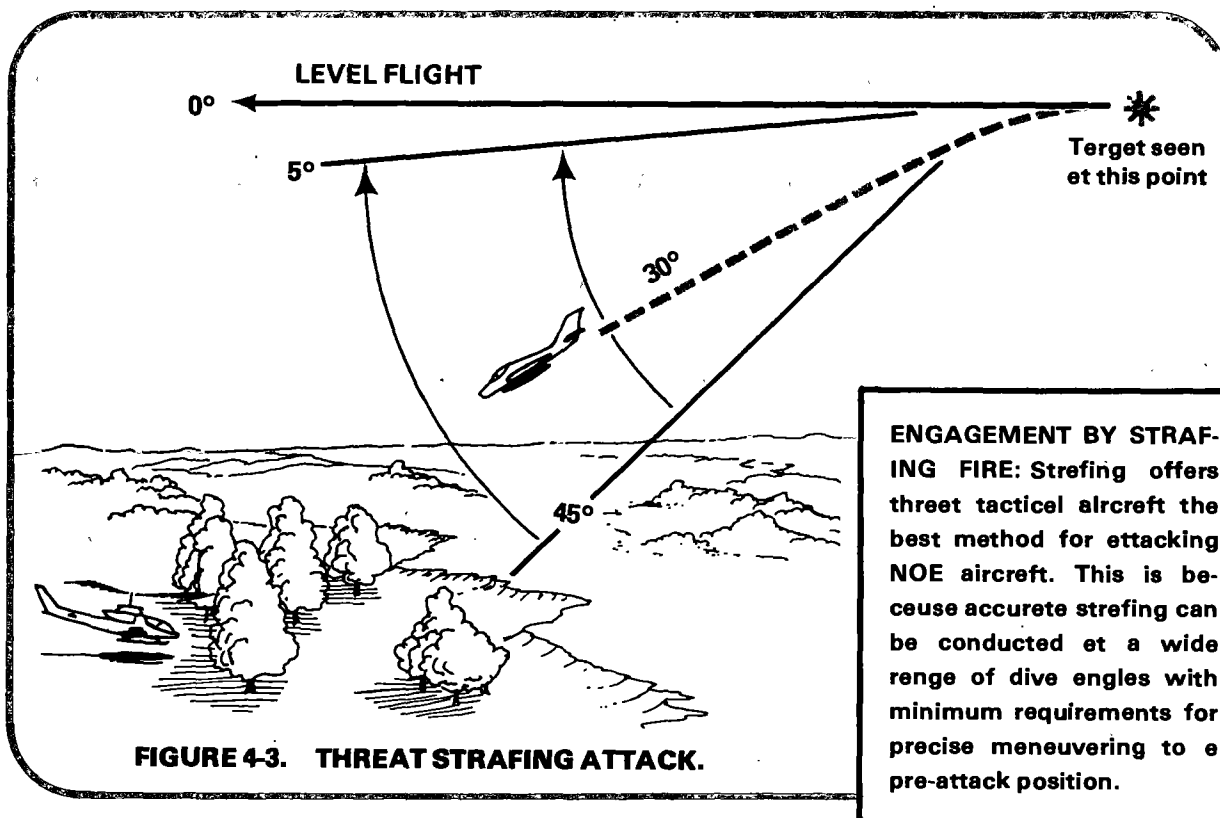
● *Actions Upon Sighting Threat High-Performance Aircraft Prior to Being Acquired:* Threat tactical aircraft normally operate in pairs, but can operate in greater numbers depending on the mission and tactical situation.

Upon sighting threat high-performance aircraft, get low, blend into terrain features, and stay still. Maintain surveillance of the aircraft and report the sighting to higher headquarters or air defense operations, if possible. Terrain permitting, mask your aircraft. If operating in platoon or larger flight, disperse. Use overwatch to forewarn and protect one another.



⌚ *Actions Upon Being Sighted and Engagement is Attempted by the Threat:* Once acquired by threat high performance aircraft, your aircraft must be within certain parameters of the threat aircraft flight envelope to be engaged. You must, therefore, try and outmaneuver the threat aircraft. To do this, you must keep the attacking aircraft in sight while maneuvering on their blind side or out of the engagement envelope. To do this against two maneuvering threat supersonic aircraft may require maneuver instructions from other nearby friendly aircraft. Use teamwork.

Once you have maneuvered on the threat aircraft blind side, try and blend into the terrain, mask, and remain still to make it difficult for re-acquisition. Generally, threat tactical aircraft engagement parameters are from a 5-degree to a 45-degree dive angle. Engagement could be by air-to-air missiles (infrared or radar guided), strafing, rockets, or bombs.

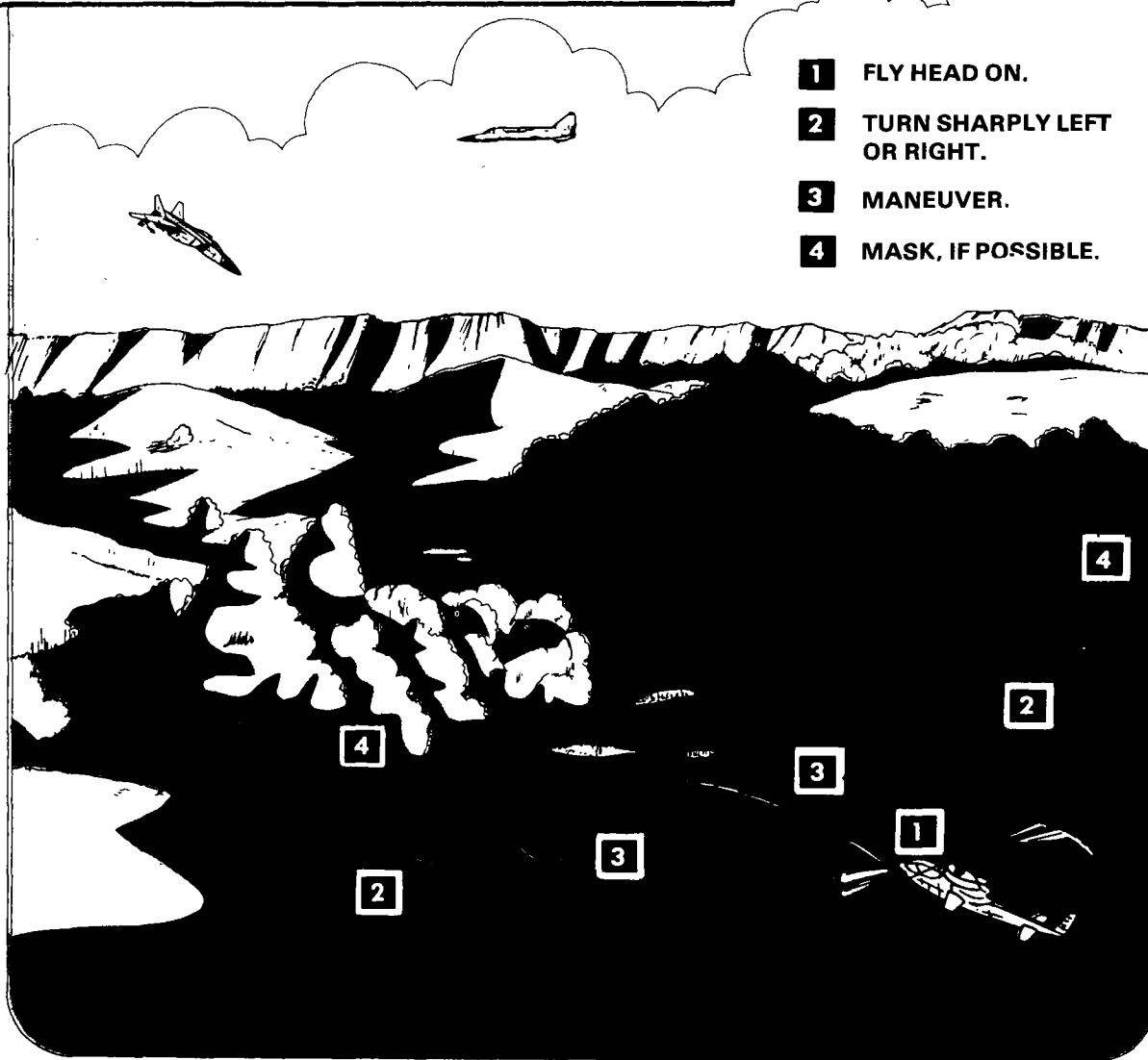


EVASIVE MANEUVERS: Due to high speeds and flight characteristics, threat high-performance aircraft, once committed on an attack angle, are not able to maneuver quickly and still keep the target within engagement parameters. Therefore, an effective evasive maneuver is to let the attacking threat aircraft commit himself to the dive angle while you fly head-on to the attacking aircraft, causing him to increase the dive angle; then execute a sharp turn left or right. At the same time, try to keep the attacking aircraft in sight and stay in his blind area by maneuver. Once in his blind area, blend into the terrain, mask, and stay still.

NOTE

Remain alert to threat wingman's position and intentions.

- 1** FLY HEAD ON.
- 2** TURN SHARPLY LEFT OR RIGHT.
- 3** MANEUVER.
- 4** MASK, IF POSSIBLE.

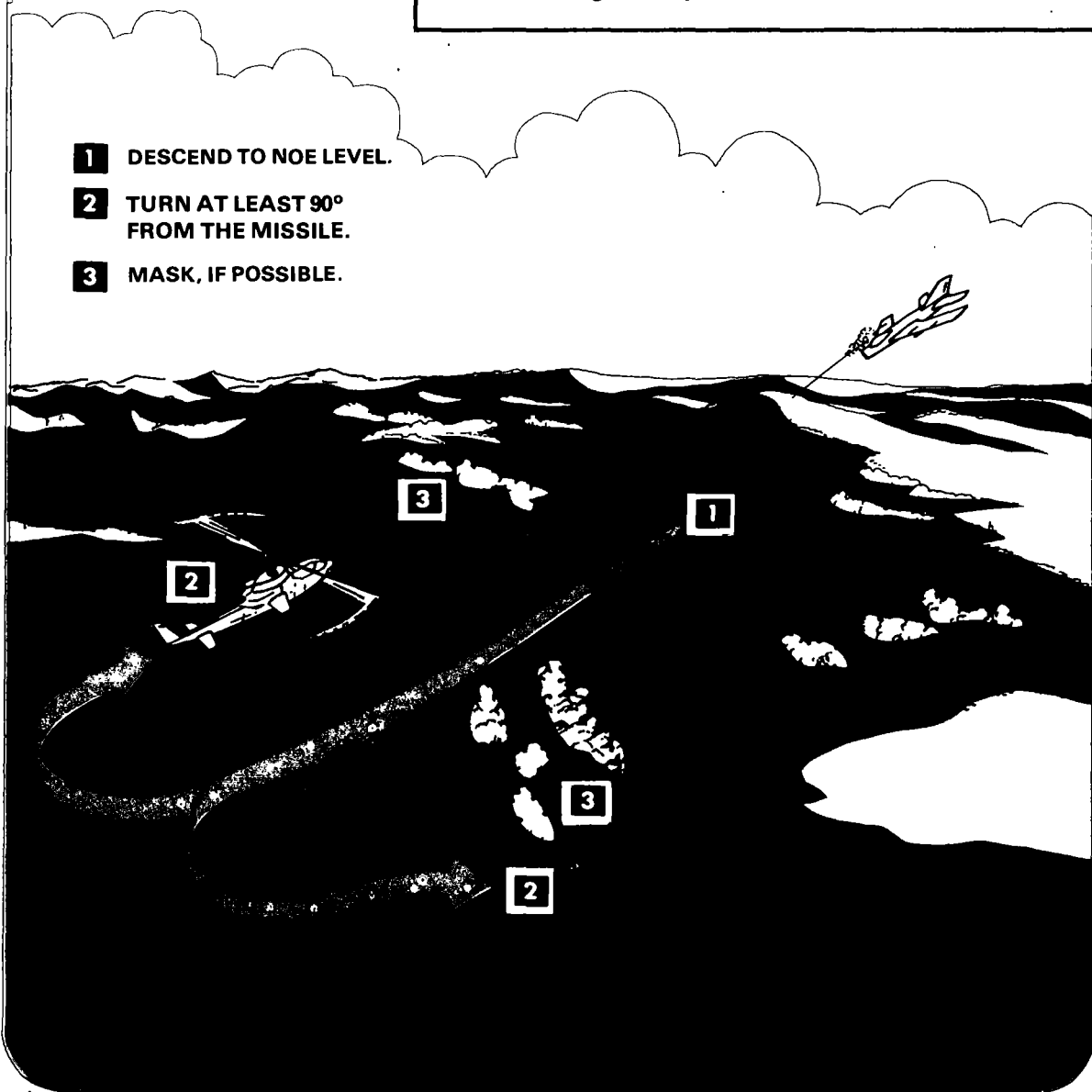


WARNING

Threat aircraft may fire up to two missiles within an interval of 1 second.

EVASIVE MANEUVERS AFTER ENGAGEMENT BY INFRARED/RADAR-GUIDED MISSILES: Once you have been engaged by an air-to-air missile, survivability will be dependent on the evasive maneuvers and actions taken during the next few critical seconds. Without regard to aircraft survivability equipment, the first thing to do is get to NOE terrain flight levels as quickly as possible, if not already NOE. Ground clutter or a sharp turning maneuver (90 degrees or more to missile flight) may cause the missile to break lock.

- 1** DESCEND TO NOE LEVEL.
- 2** TURN AT LEAST 90° FROM THE MISSILE.
- 3** MASK, IF POSSIBLE.



□ PASSIVE COUNTERMEASURES IN STATIC LOCATIONS

**COVER REFERS TO
PROTECTION FROM
ENEMY FIRE**

**CONCEALMENT IS
PROTECTION FROM
ENEMY OBSERVATION**

○ *Utilize Available Cover and Concealment:* The use of cover and concealment can enhance aviation unit static area survivability. Natural cover (ravines, hollows, reverse slopes) and artificial cover (foxholes, trenches, walls) can protect soldiers. Concealment includes not only camouflage but also light, noise, odor, and movement discipline. Natural camouflage should be used when possible and should blend in with the terrain. Camouflage nets should be used in conjunction with natural camouflage or when natural camouflage is not available. Factors affecting the use of camouflage are (1) movement, (2) position, (3) shine, (4) shape, (5) color, (6) texture, (7) dispersion, (8) and shadow.

1

MOVEMENT or arrivals/departures by aircraft into rear area airfields, command posts and other positions can be detected by radar if air assets are using procedures other than NOE or contour flight techniques. If departure/arrival altitudes above these are necessary, procedures should be used to ascend/descend away from the position area using NOE/contour flight to the position area. Ground movement by soldiers in a position area should be limited to within concealed routes, when possible. Vehicles make tracks and movement should conform to established trails or fit into the ground patterns, i.e., against and parallel to tree lines.

2

POSITION refers to the relation of men or objects to the background. Positions should permit blending or absorbing to provide concealment. Camouflage material should blend with the ground/background.

3

SHINE may be either a light source or reflected light such as glint from a windshield. Cover or camouflage all light reflective sources. Maintain light discipline.

4

SHAPE refers to the shape or outline an object presents in relation to the background. Break up the familiar shapes of equipment and use natural/artificial camouflage to make them blend into the terrain.

5

COLOR: Use camouflage colors to blend in with background colors.

TEXTURE is the degree that a surface will absorb, scatter, or reflect light. Rough surfaces tend to appear dark. Smooth surfaces may change from dark to light depending on lighting and viewing direction. Use nets, burlap, flat paint, and foliage to avoid texture contrast.

6

DISPERSION will prevent equipment clutter, making detection more difficult and enhancing survivability should detection occur.

7

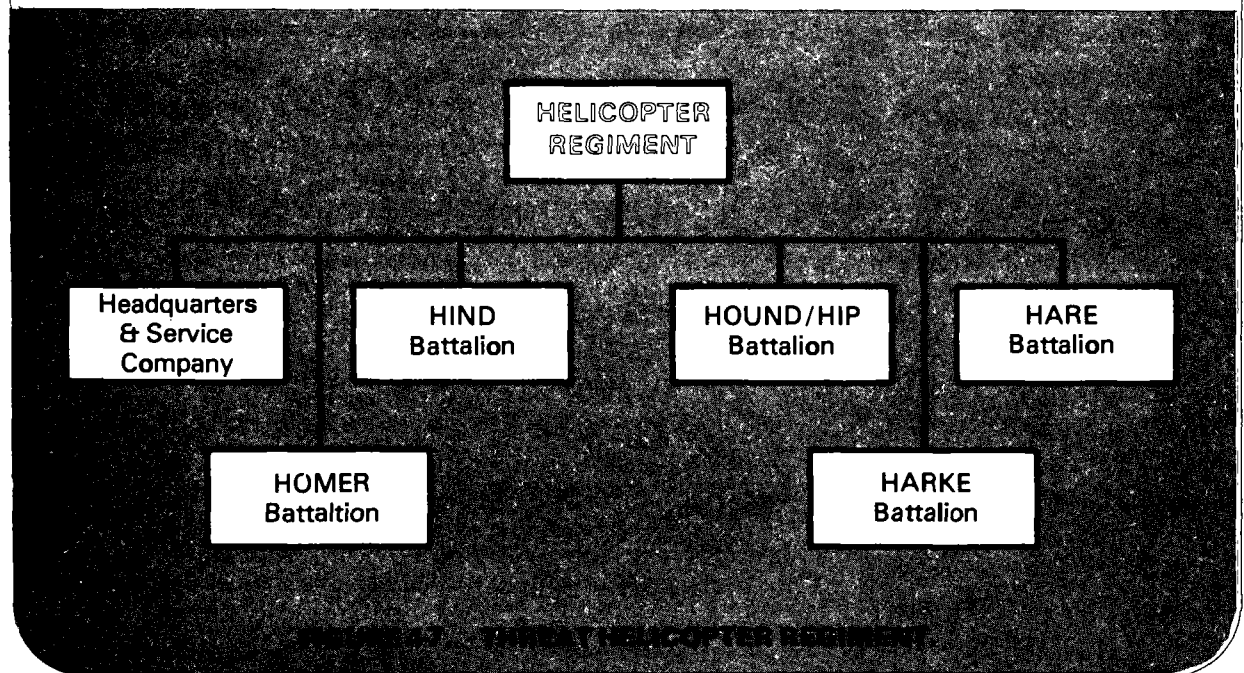
SHADOW is used to conceal men or equipment from visual detection by using the shadows cast from the sun's angle on terrain, foliage, or manmade structures.

8

THE HELICOPTER THREAT

Helicopters are organic to the threat air army. There are two helicopter regiments per air army.

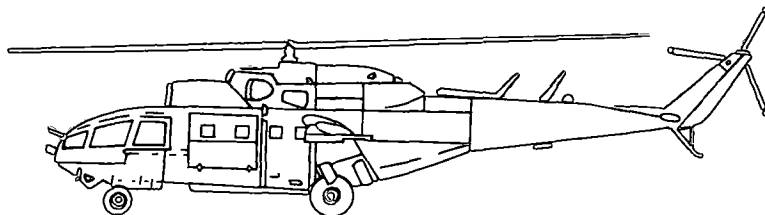
ORGANIZATION OF A TYPICAL THREAT HELICOPTER REGIMENT



EMPLOYMENT TACTICS AND TECHNIQUES

Helicopter regimental assets are provided by front commanders to lower organizational levels for specific missions and operations. Although threat assignment of helicopters in the battlefield environment differs from US Army aviation units, roles and mission assignment are similar. Threat forces are increasingly stressing the importance of helicopters in military operations (air assault, antitank, reconnaissance, resupply). The bulk of the threat helicopter build-up has been in the area of troop transport/fire support. Of significance—and the main threat to Army aviation assets—is the Mi-24 HIND A and D. Although the Mi-4 HOUND and the Mi-8 HIP, which is replacing the Mi-4, are both capable of carrying 57mm rockets and have light machineguns, they are primarily used as troop transport (airmobile) helicopters and will not be addressed. The real threat to Army aviation units is the Mi-24 A and D. Much of the information on the HIND A is classified, and little is known about the HIND D or it is classified.

HIND A



PURPOSE

Multi-role troop transport/
attack helicopter

CARRYING CAPABILITY

8 Troops

4 SWATTER antitank
missiles

128 57mm rockets

1 12.7mm machinegun

CRUISING SPEED

140 knots

MAXIMUM SPEED

160 knots

It is currently estimated that
1,500 HIND helicopters will
be in service by 1980.

To improve the ground combat effort and increase mobility and flexibility, threat forces have recently emphasized training and development of existing troop and helicopter resources for use in joint airmobile operations. Airmobile operations are supported by air defense and strong tactical air support.

It is anticipated that in the future, threat forces will make much greater use of airmobile assault during both day and night operations. The heliborne assault, often used in conjunction with paratroop operations, is becoming an important feature of the threat forces concept of the high-speed offense.

**JOINT AIRMOBILE
OPERATIONS ARE
BEING EMPHASIZED**

Armed reconnaissance missions are conducted by threat helicopters in the advanced guard role during the attack to fix and locate enemy forces so artillery and ground forces can be brought to bear on these locations, or they can be bypassed.

During the attack, air assault operations may be conducted as a flanking, rear area assault, or bridgehead maneuver to gain the advantage.

During both the offense and defense, the HIND A, armed with antitank missiles, can provide the same destructive firepower as US Army aviation assets. With our tank/mechanized destructive capability coupled with trends in aircraft survivability equipment, it may be that in a high threat environment, in addition to USAF and air defense weapons systems, a good way to kill a helicopter will be with another helicopter. Little training has been developed defensively with regard to this aspect. However, we must take this threat into consideration if Army aviation is to be effective, to survive, and to win the first battle of the next war.

● **ACTIVE COUNTERMEASURES**

**SURVIVABILITY AND
COUNTERMEASURES**

● *Suppression:* When encountering threat helicopters on the battlefield, suppression by fire should be used as a self-defense measure or as a means of protection of combined arms assets. The attack of a threat helicopter by Army aviation aircraft—for the sake of attack alone—is not currently compatible with the mission of Army aviation.

**THREAT HELICOPTERS IN
STATIC NOE POSITIONS
ARE VULNERABLE TO
FIRST-ROUND, FIRE-
FOR-EFFECT ARTILLERY
FIRE**

Due to the fleeting nature of helicopters (mobility/maneuverability) and their ability to operate under the air defense artillery envelope, suppression by artillery/air defense artillery may not be practical or feasible. However, both artillery and air defense artillery can be very effective if the element of surprise is achieved. For instance, threat attack helicopters lying in ambush in static NOE firing positions, can be extremely vulnerable to first-round, fire-for-effect, preplanned or immediate artillery suppression using variable time (VT) fuze action. Chapter 8 contains considerations and procedures for the use of preplanned/immediate artillery suppression.

If attacking Army aviation assets, threat helicopters may be lured into friendly air defensive fire envelopes for suppression purposes. Locations and engagement sectors of friendly air defense artillery and Redeye missile teams can be ascertained through coordination with the supported combined arms maneuver unit S3/G3. This should be part of good premission planning. Threat helicopters may also be lured into position for suppression by maneuver unit small arms fire.

Friendly tactical air suppression may be requested through supported maneuver unit S3 (Air) channels. Considerations and procedures are discussed in chapter 8.

**HELICOPTER WEAPONRY
REQUIRES:**

- TEAMWORK
 - SURPRISE
 - FIRING FIRST
 - ACCURACY
-
-

When using organic on-board helicopter weaponry for suppression, teamwork, surprise, firing first, and firing accurately are the most important factors in gaining the tactical advantage.

The availability and urgency of fire suppression will determine the means used against the threat.

☐ **PASSIVE COUNTERMEASURES**

Passive countermeasures employed against threat helicopters will be much the same as those employed against ground maneuver units.

○ *Utilize Terrain Flight Techniques:* In order to avoid detection and gain surprise, terrain flight techniques must be utilized. Standoff helicopter firing techniques may not be well advised against threat attack helicopters as they may possess superior range. NOE flight techniques—overwatch, masking, pop-up—will aid in detection avoidance. We can gain surprise and the tactical advantage by seeing the enemy first, maneuvering on his blind side (flank/rear), firing first—with all available means, and firing accurately.

**STANDOFF FIRING
SHOULD NOT BE USED
AGAINST THREAT
ATTACK HELICOPTERS**

○ *Utilize Teamwork:* We can gain the tactical advantage by utilizing teamwork to observe, fire, and maneuver against threat helicopters.

○ *Utilize Deception:* Utilizing overwatch and decoy techniques, we may be able to lure threat helicopters into ambush by deceiving them as to our true intentions. Air-to-air “dogfight” combat techniques should be avoided. Air-to-air missile tactics and maneuver remain valid as previously discussed in the “high-performance threat” section.

○ *Minimize Exposure Time:* Exposure time can be minimized by taking advantage of available terrain for masking the aircraft. When engaging the enemy, employ fire and maneuver using pop-up firing techniques and preselected multiple firing points.

○ *Infrared Jammers:* Infrared jammers offer an effective means of foiling lock-on by infrared missiles. Effectiveness of the infrared jammer is enhanced when used in conjunction with infrared suppression.

FUTURE TRENDS

○ *Hellfire Missile System*

○ *Flare Dispensing:* A flare dispensing system would be employed as an infrared missile decoy system in conjunction with a missile launch/approach detector.

○ *Chaff Dispensing System:* Chaff would be dispensed in conjunction with initiation of an evasive maneuver upon radar warning receiver tracking indications or upon visual detection of a missile launch.

NOTE

Visual detection of a missile launch without a radar warning receiver indication most likely means the missile is infrared guided. In this case, flares would be ejected.

○ *Missile Launch/Approach Detector:* The missile launch/approach detector will automatically dispense a flare on detection of an infrared missile launch.

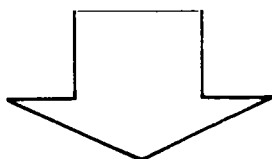
○ *Vulnerability Reduction Equipment:* Trends in vulnerability reduction include infrared signature reduction, ballistic tolerance, and radar cross-section reduction equipment as previously discussed in chapter 2.

Research has brought about decreased visual detection vulnerability through improved paint and canopy designs that reduce glint and blend more favorably with the background.

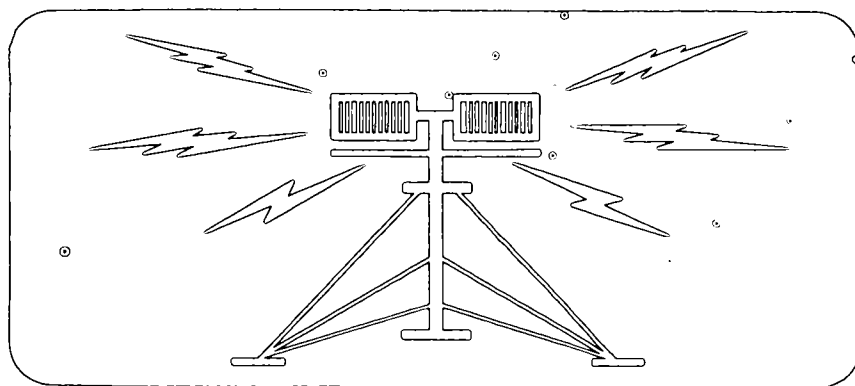
SUMMARY

The threat tactical air capability has improved greatly over the past few years. Indications are that capabilities, both in numbers and weapons systems, will increase sharply in the future. Currently, through use of proper premission planning, combined arms teamwork, tactics, and countermeasures, we can meet the tactical air threat, survive, and win. However, we will need to develop new tactical doctrine and ASE on a consistent basis, coupled with rigorous testing and training to remain able to meet the tactical air threat, survive, and win.

CHAPTER FIVE



SURVIVAL OF THE ELECTRONIC WARFARE (EW) THREAT



THE ELECTRONIC WARFARE (EW) THREAT

Electronic warfare! The modern battlefield will be saturated with electronic emissions varying from the AN/PRC-77 platoon radio to the corps radio complex operated in the corps rear area. Between these two areas, from the forward edge of the battle area (FEBA) to the corps rear area, hundreds more pieces of Army equipment will be emitting electromagnetic energy susceptible to being located, tracked, monitored, and destroyed by the enemy. Sounds quite frightening—and it should be. The Army aviator must, therefore, be aware of threat electronic warfare capabilities and methods of employment if he is to be victorious in the first battle of the next war.

We can expect the enemy to employ signal intercept operations, direction-finding, jamming, and deception as part of his overall warfare plan. Further, we can expect him to attempt to systematically analyze US Army communications and noncommunications emitters which are key to command and control functions. Finally, we can expect the enemy to attempt to destroy one-third of our communications facilities, degrade another one-third by jamming operations, and leave one-third open for surveillance/intelligence-gathering purposes.

***SURVIVABILITY,
COUNTERMEASURES,
AND COUNTER-
COUNTERMEASURES***

Threat forces will attempt to monitor, disrupt, or destroy our communications. Each member of the combined arms team must make every effort to reduce the enemy's capabilities in the electronic warfare environment. The free use of communications will not be available to the aviator on the high threat battlefield. It is, therefore, of the utmost importance that aviation personnel know the EW capabilities of the threat and what can be done to prevent or minimize their effects and continue the mission.

THE SIGNAL INTERCEPT THREAT

The enemy will employ forces within the combined arms framework with the specific mission of intercepting and analyzing US communications for intelligence purposes. Signal intelligence (SIGINT) includes information gathered from communications and noncommunications transmitters.

Threat forces consider SIGINT a primary source of intelligence. Through pattern analysis, traffic analysis, and message content, threat forces are able to determine the opposing force structure, composition, capabilities, and intentions.

The signal intercept capability of threat forces spans a large frequency band. Signal intercept operations are conducted to:

①

Gain intelligence information for tactical operations.

②

Gain information concerning the technical characteristics of enemy equipment and operating procedures.

③

Form a data base for the conduct of new and on-going operations.

Army aviation units have a varied array of tactical communications equipment which normally is used constantly for navigation and communication. The frequency modulated (FM) radio is the most critical radio with respect to aviation combined arms operations.

The aviator must constantly be aware that his radio transmissions can be and most probably are being monitored. Using the secure radio mode, keeping transmission time short, and using authorized codes when not secure are only a few of the necessary defensive tactics discussed further in this chapter. Remember, the enemy can listen to almost anything you say, so keep it secure if possible; or in code if not secure.

○ *Operate FM Radio in Secure Voice Mode:* Operating in the secure voice mode is the best method of radio communications to prevent intercept.

COUNTERMEASURES AND COUNTER- COUNTERMEASURES

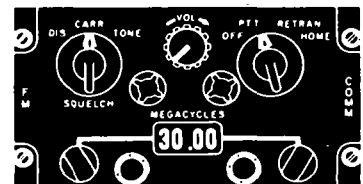
○ *Use Correct Communications Procedures:* Use approved and correct communications words, phrases, and codes. Plan what you want to say before you key the transmitter. This will eliminate confusion and reduce transmission time.

○ *Limit Transmission Time:* Be brief and to the point. Don't give the threat any more time to listen to your transmission than necessary. Ideally, transmission should be 20 seconds or less.

○ *Use Communications Equipment Only When Necessary:* Do not use electronic communications unless you absolutely need them. If you don't need them, turn them off. If alternate means are available and effective, use them instead. Plan missions in enough detail to prevent unnecessary transmissions. A solid communications standing operating procedures (SOP) will help.

○ *Use the Communications Electronic Operation Instructions (CEOI) Codes and Brevity Lists:* When operating in non-secure modes use codes and brevity lists to prevent compromise of information that could aid the enemy. The use of codes and brevity lists will also decrease transmission times. Never use your own makeshift codes.

○ *Require Random Authentication by Operators in the Net:* Requiring random authentication by operators in the net will insure only friendly operators are using the net.



FREQUENCY MODULATED
(FM) RADIO

AUTHENTICATION IS REQUIRED WHEN:**1****YOU SUSPECT THE ENEMY IS IN YOUR NET.****2****SOMEONE CHALLENGES YOU TO AUTHENTICATE.****3****YOU TELL A STATION TO GO TO RADIO SILENCE OR ASK IT TO BREAK THAT SILENCE.****4****YOU TALK ABOUT ENEMY CONTACT, GIVE AN EARLY WARNING REPORT, OR ISSUE A FOLLOWUP REPORT.****5****YOU TRANSMIT DIRECTIONS WHICH AFFECT THE TACTICAL SITUATION, SUCH AS "CHANGE LOCATION," "SHIFT FIRE," "CHANGE FREQUENCIES," OR "TURN OFF THE RADIO."**

**YOU ARE AUTHORIZED TO TRANSMIT A
CLASSIFIED MESSAGE IN THE CLEAR.**

**YOU TRANSMIT TO SOMEONE WHO IS
UNDER RADIO LISTENING SILENCE.**

**YOU CANCEL A MESSAGE BY RADIO OR
VISUAL MEANS, AND THE OTHER STATION
CANNOT RECOGNIZE YOU.**

**UPON ENTERING A RADIO NET OR RESUM-
ING TRANSMITTING AFTER A LONG
PERIOD.**

**YOU TRANSMIT A MESSAGE WITHOUT
GETTING A TIMELY RESPONSE. IF AUTHEN-
TICATING, REQUIRE ANOTHER AUTHEN-
TICATION.**

○ *Change Operating Frequencies Frequently:* The CEOI establishes times for frequency changes. Use alternate frequencies only as necessary.

○ *Use Alternate Means of Communications:* The use of hand, arm, smoke, pyrotechnics, placards, lights, and coded matrixes are a few alternate means. (See communications techniques discussed later in this chapter.) SOP and teamwork are a must. When used properly, alternate communications can be very effective.

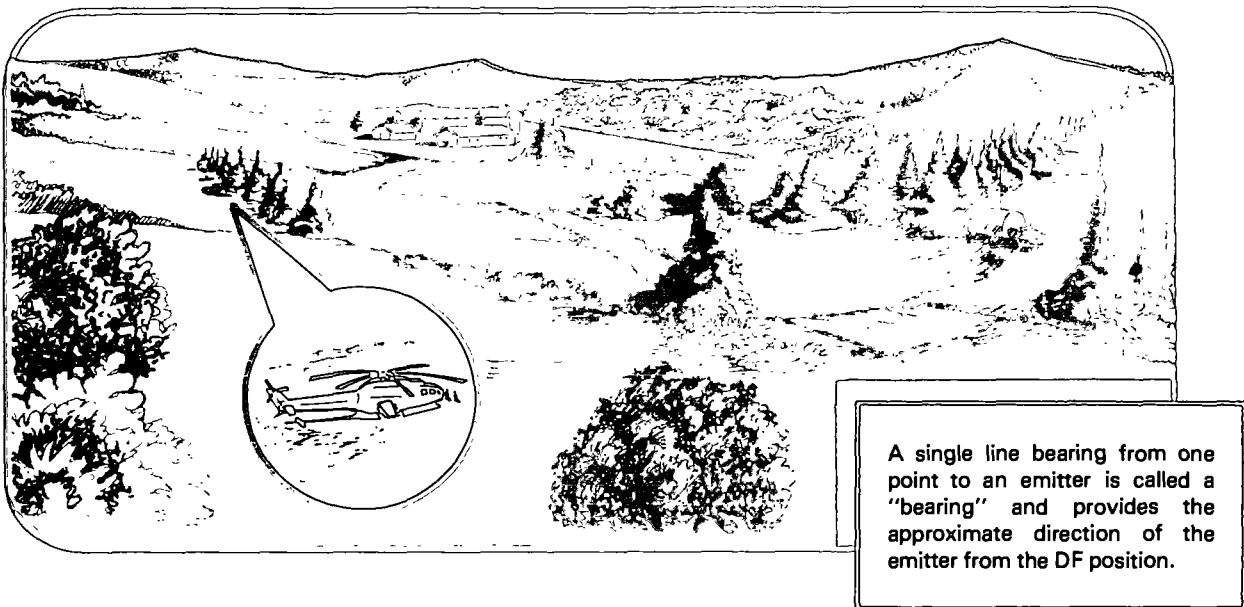
○ *Use Low Power When Available:* Use low power transmitter modes on radios and beacons to limit range when high power is not necessary.

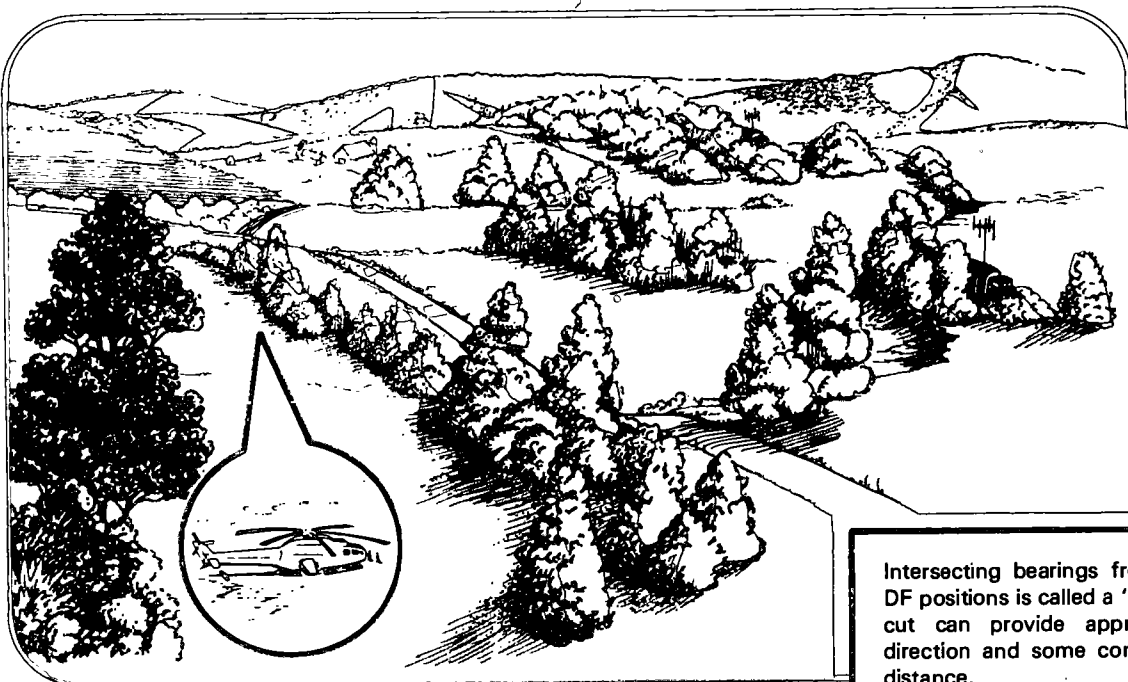
○ *Mask Antennas:* Mask antennas to prevent signal radiation in the direction of the enemy.

○ *Use Directional Antennas:* Aviation ground antennas can be directionally rigged to preclude signal radiation into enemy territory. This technique is most often used as a jamming countermeasure.

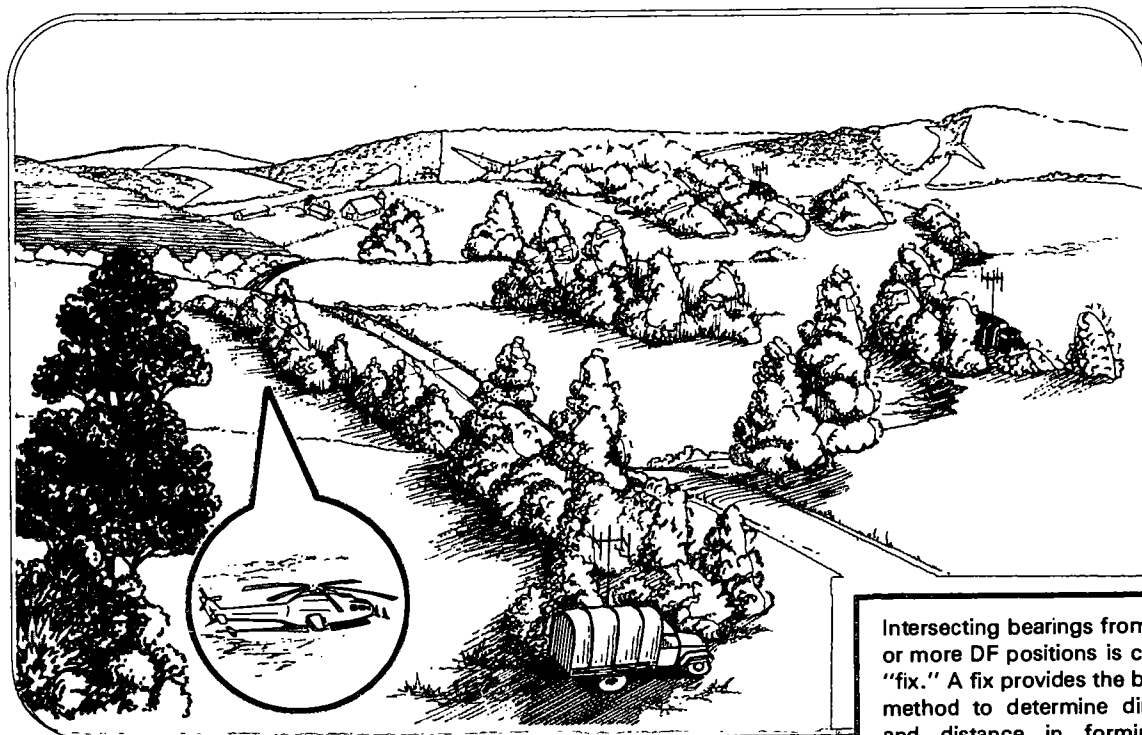
THE DIRECTION-FINDING THREAT

“Direction-finding” (DF) is a collective term applied to the technique of determining line bearings from one or more direction-finding positions to radio or radar emitters.





Intersecting bearings from two DF positions is called a "cut." A cut can provide approximate direction and some concept of distance.



Intersecting bearings from three or more DF positions is called a "fix." A fix provides the best DF method to determine direction and distance in forming an approximate location.

Direction-finding is accurate and effective because this source of intelligence-gathering is integrated and employed by the threat in conjunction with other intelligence sources to locate enemy transmitters.

Direction-finding is mainly used to analyze and detect unit groupings and movement, and to sort out communications systems. Finally, it can be used to tell the threat where enemy forces are *not* located.

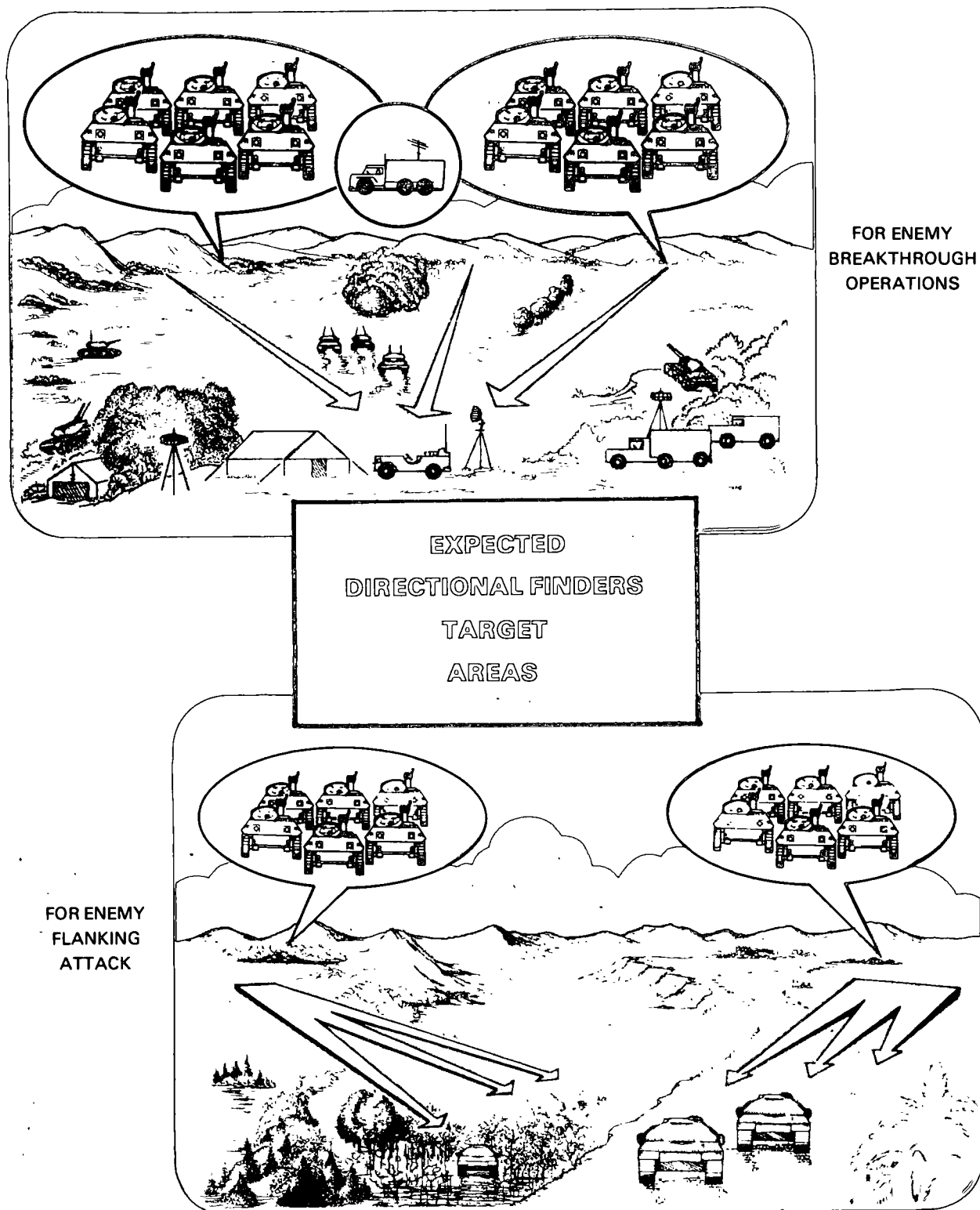
**DIRECTION-FINDING SERVES A MULTITUDE
OF INTELLIGENCE PURPOSES TO INCLUDE:**

- ⊙ Location of transmitters.
- Targeting data for suppressive fires.
- Intelligence data for planning future operations.
- ⊙ Planning data for jamming operations.

Threat forces may employ their direction-finders in one of two modes: *Straight or concave baseline, triangular or quadrilateral base pattern.*

If the objective of the threat is to obtain the best bearing to enemy transmitters within a compact, narrow division area of the forward edge of the battle area (FEBA), most likely he will use a straight or concave baseline. This method provides the best azimuth angles at short ranges (out to 20 km) and fair angles at longer ranges (20 km to 75 km).

If the object of the threat is to obtain the best bearings over a wide flanking area, most likely he will locate his DF position in a triangular or quadrilateral base pattern which provides fair azimuth angles on most transmitters at the expense of more accurate angles on transmitters within short range.



COUNTERMEASURES AND COUNTER- COUNTERMEASURES

For the most part, the mobility of Army aircraft will preclude effectiveness of the direction-finding threat. However, stationary aviation assets, antennas, and transmitters can be particularly vulnerable to the direction-finding threat if not cognizant of countermeasures/counter-countermeasures.

○ *Use Communications Equipment Only When Necessary:* Limit use of communications equipment. Turn beacons on only when necessary. Use other communications resources (wire) when available.

○ *Limit Transmission Time:* The use of codes, brevity lists, and short call signs (after initial contact) will help to decrease transmission times. Transmission times of 30 seconds or less are more effective in denying directional fixes by the threat.

○ *Relocate Assets Frequently:* Operation in one location for extended periods is an open invitation for elimination.

○ *Remote Antennas:* Remote beacons and antennas away from ground locations as far as practically possible.

○ *Utilize Decoy Antennas:* If practical and equipment availability permits, erect decoy antennas in credible locations (2 km to 5 km) away from actual unit locations. Camouflage real antennas and beacons if possible.

DETECTION OF RADIO SIGNALS CAN BE MINIMIZED BY USE OF LOW POWER

○ *Use Low Power Transmitting Modes When Feasible:* The use of low power modes will limit signal radiation range.

○ *Use Directional Antennas When Feasible:* Directional antenna modifications limit signal radiation to only desired directions.

● *Mask Antennas and Beacons:* Mask radiating antennas and beacons from the enemy.

● *Employ Alternate Means of Communications:* See tactical communications techniques portion of this chapter.

● *Do Not Refer to Your Location by Ground Reference Points:* A common practice by aviators is to use terrain features and headings to define targets. All the enemy has to do is plot a back-azimuth from the identified terrain feature. Use code, prearranged checkpoints, or azimuth only in identifying targets.

**WHEN IDENTIFYING
TARGETS TRANSMIT:**

- CODE
 - PREARRANGED
CHECKPOINTS
 - AZIMUTH
-

● *Use Secure Voice or Authorized Codes Only When Referring to Location:* Never use clear text or unauthorized codes in identifying friendly positions except in emergencies. Use authentication rules when asked for friendly locations.

THE JAMMING THREAT

“Jamming” is defined as *the deliberate radiation, reradiation, or reflection of electromagnetic energy with the objective of impairing the enemy’s use of electronic devices, equipment, or systems.*

We can expect the threat to use jamming as a means of disrupting, confusing, and denying our use of communications systems. It should be noted that all radio interference may not be jamming, but rather could be related to radio malfunction, antenna placement, atmospheric disturbances, overcrowded radio nets, or a multitude of other reasons. Therefore, it must first be determined if the interference is caused by actual jamming.



1*

Although any transmitter can serve as a jammer, certain types of jamming signals such as those shown below have been considered more effective.

TYPES OF JAMMING SIGNALS

NOTE: Asterisk means the signal can also be unintentional.



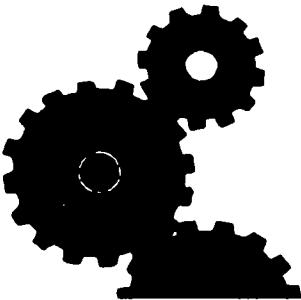
2*

Babbled Voice. This signal is composed of mixed voices engaged in simultaneous conversations, preferably in the same language, with voice characteristics similar to those found in the victim communications net.

1*

Tone. This jamming signal is a single frequency of constant tone. It is used to jam manually keyed Morse code, voice, and radio carrier circuits.

2*



3*

Pulse. This signal resembles the monotonous rumble of rotating machinery. Pulse jamming signals produce a nuisance effect on voice communications circuits.

3*

Recorded Sounds. Any audible sound, especially of a variable nature, that can be used to distract operators and disrupt communications circuits. Music, screams, applause, whistles, machinery noise, and laughter are examples.

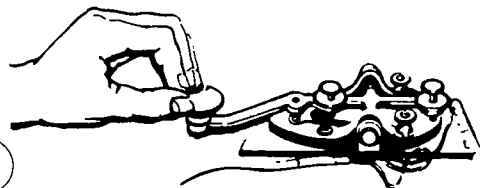
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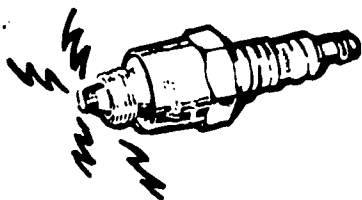
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Random-Keyed Morse Code. This jamming signal is produced by keying a Morse signal at random and mixing the keyed signal with spark noise. It is effective against voice and Morse code communications.

5*



5*



6



7

Spark. This signal is easily produced and is one of the most effective for jamming. Bursts are of short duration and high intensity, repeated at a rapid rate. The time required for receiver circuitry and the human ear to recover after each spark burst makes this signal effective in disrupting all types of radio communications.

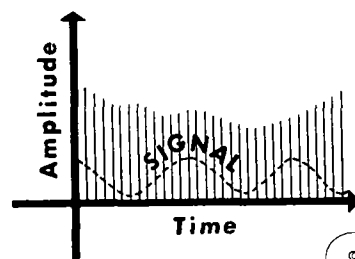
Gulls. The gull signal is generated by a quick rise and slow fall of a variable audio frequency and is similar to the cry of a sea gull. It produces a nuisance effect on voice circuits.

Random Noise. This is synthetic radio noise which is random in amplitude and frequency. It is similar to the normal background noise and can be used to degrade all types of signals; however, a great amount of power is necessary to jam voice communications.

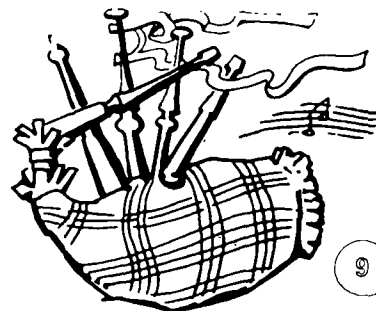
Stepped Tones. These are tones transmitted in increasing pitch, producing an audible effect similar to the sound of bagpipes. Stepped tones are normally used against single-channel AM and FM voice circuits.

Wobbler. The wobbler signal is a single frequency varied by a low and slowly varying tone. The result is a howling sound which causes a nuisance effect on voice communications.

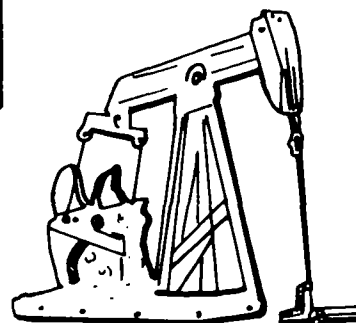
Random Pulse. Pulses of varying amplitude, duration, and rate are generated and transmitted to disrupt teletypewriter, radar, and all types of data transmission systems.



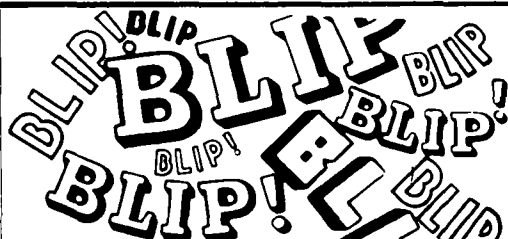
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9



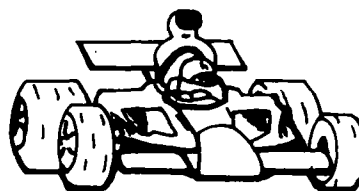
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11

⑫

Rotary. The rotary signal is produced by a low-pitched, slowly varying audio frequency, resulting in grunting sounds. It is used against voice communications.

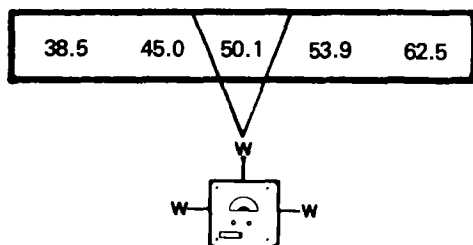


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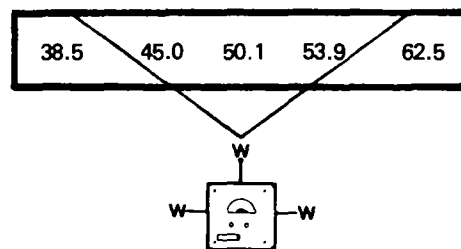
JAMMING TECHNIQUES

The enemy normally will employ three types of jamming: ① Spot, ② barrage, and ③ sweep.

- ① **SPOT JAMMING.** Threat spot jamming techniques concentrate most of the jamming power on one selected frequency. It is useful for accurate, effective, controlled jamming of a selected frequency; power is not wasted on frequencies other than the selected one. In this manner, spot jamming can be used within a frequency band without interfering with other transmissions.
- ② **BARRAGE JAMMING.** Barrage jamming spreads the transmitted power over a wide band of frequencies. It affects all frequencies within both the band and the transmission range. Since the transmitted power is spread over a wide range of frequencies, barrage jamming does not saturate any single frequency. Its advantage is that little need be known about the receivers that are being jammed. Its disadvantages are that it wastes power, since it jams frequencies that are not being used, and it interferes with all transmissions—both enemy and friendly.
- ③ **SWEEP JAMMING.** Sweep jamming is typified by rapid changes in the jamming frequencies through a wide band. Sweep jamming is similar to barrage jamming in that it covers a wide frequency band. It is similar to spot jamming in that most of its available power is concentrated on a single frequency, though only for a short time, as the jammer repeatedly sweeps back and forth across the band. As the sweeper moves across the band, each frequency gets almost all the power of the jamming signal. Although the power of the jammer is only briefly concentrated on a frequency, it takes time for the receiver circuitry to recover from the effects of the jamming signal.



SPOT JAMMING



BARRAGE JAMMING

Jamming may take many forms and may, therefore, be undiscernible to the untrained operator. All potential radio operators should be trained in threat jamming techniques and to determine if jamming is actually taking place. No counter-countermeasures should be taken until it has first been determined if jamming is taking place.

COUNTERMEASURES AND COUNTER- COUNTERMEASURES

BASIC CAUSES OF INTERFERENCE

1 ATMOSPHERIC DISTURBANCES.

3 WEAK SIGNALS.

2 LOCAL INTERFERENCE.

4 ENEMY JAMMING.

However, it must be remembered that the best defense is a good offense—so let's first discuss countermeasures that can be taken to preclude jamming.

○ *Mask Antennas:* This will preclude the enemy from receiving signals to spot jam and protect the antenna from barrage or sweep jamming.

○ *Use Communications Equipment Only When Necessary:* Use radios, beacons, navigational aids, and electronic equipment only as needed. If you don't need them, turn them off.

○ *Limit Transmission Time:* Use brevity lists and abbreviated call signs. Know what you want to say before keying the transmitter. Don't chatter.

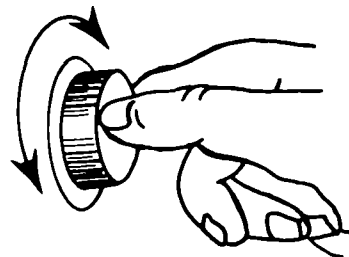
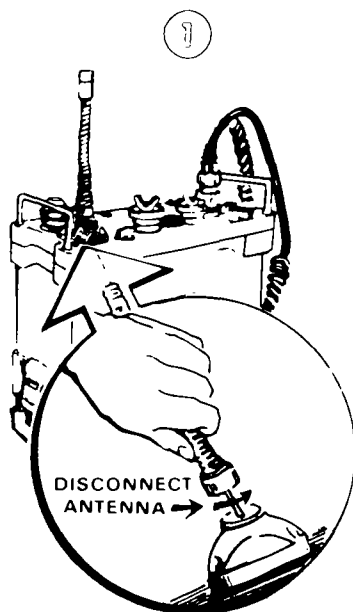
○ *Use Low Power If Possible:* This may prevent the enemy from receiving signals to spot jam.

○ *Rely on Alternate Means of Communications When Feasible:* The more you train using alternate communications means, the less dependent you will be on radio communications.

○ *Use Directional Antenna Modifications When Feasible:* This will limit the enemy's reception capabilities and strengthen your communications.

If interference is experienced by the radio operator on the ground, the following can be done to distinguish between receiver, local, and jamming interference:

Disconnect the antenna. If the interference continues, it is in the radio set. If not, the interference will stop.



②

If interference decreases when the antenna is disconnected, it must then be determined if it is local interference. Try tuning several hundreds of kilohertz on each side of the signal frequency to which you are tuned. If there is no change in the intensity of the interference, you are receiving electrical interference from a nearby source (powerline, generator set, or radar set).

If the operator is well trained in the types of jamming and types of jamming signals, he may be able to recognize jamming at the onset of the interference. If it has been determined that you are being jammed, counter-countermeasures must be taken to render the jamming ineffective.

○ *Keep Operating:* Never say anything to indicate to the enemy that he is effective in his jamming operations. Try to work through the jamming. Repeat transmission and give "Say again," as necessary. If the jamming is a sweep type, you may be able to transmit briefly during lulls of jamming intensity.

○ *Mask Your Antenna:* If it can be determined from which direction the jamming is likely to be coming, locate your receiver between a natural obstacle and the enemy jammer.

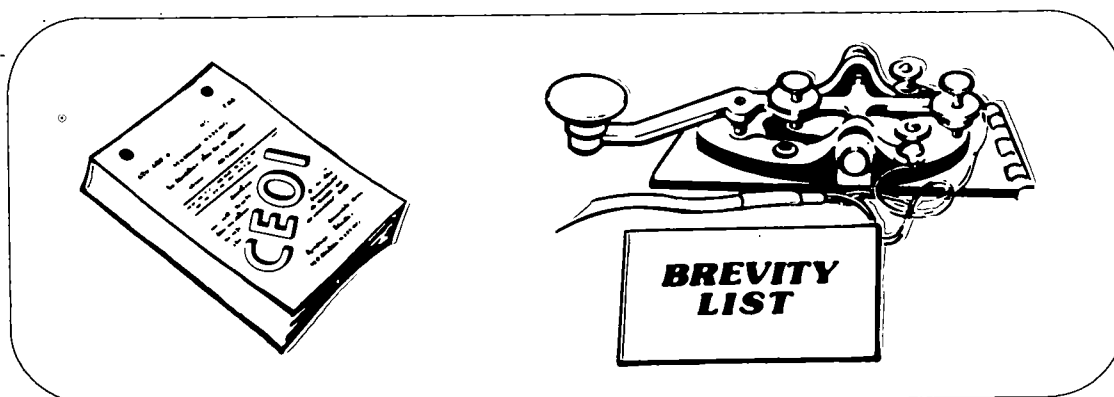
Ⓢ *Retune Your Radio:* Try tuning the radio a few kilohertz above or below the operating frequency to see if that will decrease the jamming signal and continue to operate.

○ *Switch to High Power:* If operating in low power mode, switch to high power in an attempt to override the jamming signal.

○ *Use Alternate Means of Communications:* Switch to very high frequency (VHF), ultra high frequency (UHF), or frequency modulated (FM) radio if possible. Use CEOI brevity lists for switch code. Use hand, arm, placard, aircraft position, or smoke signals as per unit SOP if possible. Good premission planning will also eliminate many communications requirements.

○ *Use a Relay Station:* If possible, use relay stations to work through jamming.

○ *Change to an Alternate Frequency:* After all else has failed, short of messenger service, change to an alternate frequency. This should be on an emergency basis only and frequency change is designated by CEOI brevity code. Authentication is required.



● *Use Messengers:* If jamming is too intense to operate through and communications are a must, the helicopter could be very adaptable to messenger type communications.

● *Use Directional Antennas:* Ground aviation operator personnel may be able to rig a directional antenna to preclude jamming.

● *Report Enemy Jamming:* Once it has been discovered that you are being jammed, report the interference as soon as practicable to higher headquarters. The report is called a meaoning, intrusion, jamming, and interference (MIJI) report. Reporting enemy electronic interference or deception is our most important defense. When you do report, US intelligence can locate him, jam him, or destroy him.

THE MIJI REPORT IS RENDERED AS FOLLOWS BY LINE:

1. **Type report:** Meaoning, interference, jamming, or intrusion.
2. **Affected station:** Call sign and suffix.
3. **Location:** Your grid location (encrypted).
4. **Frequency affected:** Frequency encrypted.
5. **Type equipment affected:** UHF, VHF, FM, beacon, etc.
6. **Type interference:** Type jamming and type signal.
7. **Strength of interference:** Strong, medium, or weak.
8. **Time interference started and stopped:** If continuing, so state.
9. **Interference effectiveness:** Estimate percent of transmission blockage.
10. **Operator's name and rank:** Self-explanatory.
11. **Remarks:** List anything else that may be helpful in identifying or locating source of interference.

THE DECEPTION THREAT

“Deception” is defined as the deliberate radiation, reradiation, absorption, or reflection of electromagnetic energy in a manner intended to mislead an enemy in the interpretation or use of information received by his electronic system. There are two major categories of deception—*manipulative* and *imitative* deception.

● *Manipulative Deception.* Manipulative deception is erroneous information purposely inserted into electronic transmissions with the expressed intention of deceiving the enemy. Some examples of manipulative deception might be:

▲ Bogus radio calls divulging nonexistent units, equipment, or location for future employment.

▲ Exaggeration of enemy losses, battle damage, or prisoners of war.

▲ Propagation of false intelligence information as to the tactical plans, makeup, or composition of our forces.

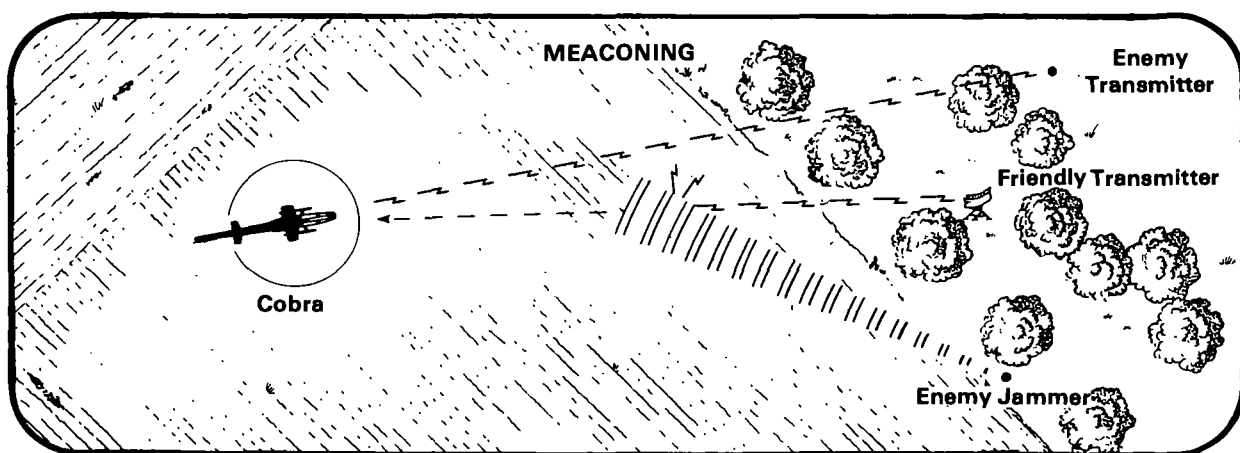
▲ Chaff (chap 2) gives false imagery to the radarscope used for radar-guided antiaircraft systems.

Manipulative electronic deception is true electronic signature forgery. In other words, electronic emitters are manipulated to show communications that are nonexistent in that particular fashion. In essence, manipulative deception is a portion of tactical deception.

● *Imitative Deception.* Imitative deception is intrusion into an enemy's communication or navigation net for the purpose of deceiving him by introducing traffic or signals in imitation of his own communications. Some examples include:

▲ **Voice imitations**—After monitoring a particular radio net, the threat may attempt to mimic a particular person in order to pass bogus information or gain intelligence information.

▲ **Meaconing**—“Meaconing” is the term applied to the process of altering navigational signals in an effort to mislead pilots who depend on navigational aids for geographic orientation. Normally, this is accomplished by blotting out the desired signal and establishing a false beacon from another location. In this manner, aircraft may be lured into ambush positions or troops/ordnance dropped in the wrong areas. Pilots should be alert to detect unexplained changes in automatic direction finder (ADF) needle heading indications, signal strength, FM homing audible differentiations, or unexplained changes in radar vector headings.



COUNTERMEASURES AND COUNTER- COUNTERMEASURES

The foremost deceptive threats to Army aviation are imitative deception and meaconing:

● **Imitative Deception.** Imitative deception could be used to try and get you to compromise tactical information of intelligence value or mislead you into taking a desired course of action. Aviation personnel should be on guard against this threat and take remedial action to prevent deception.

▲ **Use Secure Voice When Feasible**—The use of secure voice modes will prevent the enemy from entering your net.

▲ **Authenticate Randomly With Known Stations—**Random authentication will let you know if the enemy is operating in your net.

▲ **Authenticate When Required—**Always require unknown stations to authenticate. Play by the rules for transmissions requiring authentication. If stations are not able to authenticate within 20 seconds, require authentication again using different letters. Sometimes the enemy will call another station with the challenge and get the correct authentication response.

**DEMAND
IMMEDIATE
AUTHENTICATION**

▲ **Use Alternate Means of Communication When Feasible—**Good premission planning and a good unit communications SOP will help. Rely on radio communications to the least degree possible.

● ***Meaconing.*** The threat may use meaconing against Army aviators to try and draw them into ambush, drop men or equipment at erroneous locations, or place ordnance at unintended locations. When using navigational aids, aviators should be on guard against this threat.

▲ **Preplan the Mission in Detail—**When planning a mission with the use of radar, radio beacons, or FM homing, use checkpoints and time/distance/heading as a backup. This will aid you in determining if you are on the right course.

▲ **Require Authentication—**Require stations giving radar vector and FM homing assistance to authenticate.

▲ **Use Resection—**If you suspect meaconing, take two to three fixes from known location along your flightpath and locate the origin of the beacon by resection. You must know the location of the friendly beacon and your location to do this.

▲ **Report Meaconing—**Use the MIJI report format. The meaconing station can then be located, jammed, or destroyed.

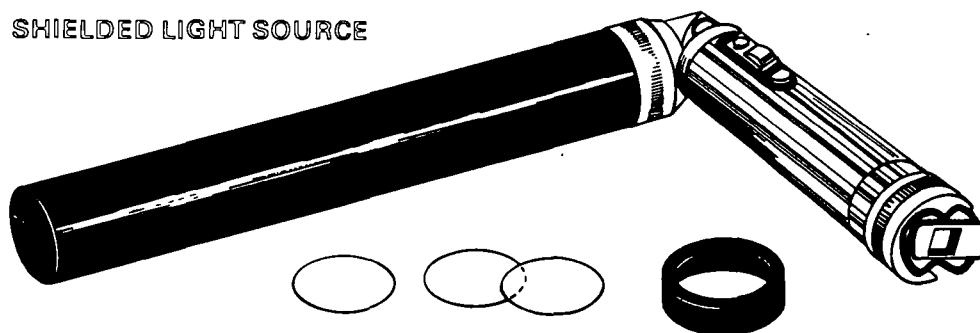
TACTICAL COMMUNICATIONS TECHNIQUES

The high threat environment demands innovative methods of communications in order to accomplish the mission. The EW threat alone is not our only communications threat. The lethality of the battlefield dictates Army aviation operations as close to the earth's surface as possible in order to survive. Operations in the nap-of-the-earth (NOE) environment will also create communications problems. It is, therefore, incumbent on every aviation unit commander to insure proven alternate means of communications are established by SOP to get the job done. Techniques and procedures can be as varied as the imagination permits as long as they are effective. Effective application of alternative communications techniques are a direct result of unit planning and training.

☐ NIGHT COMMUNICATIONS TECHNIQUES

☉ *Shielded Lights:* Communications at night can be conducted by the use of a flashlight. Morse code or a predetermined code system can be used. Examples are provided below. Covers or tubes can be made to assist in making the light more directional. Colored lenses can be used in conjunction with light signals unless night vision goggles are being used. All light sources appear green with night vision goggles.

SHIELDED LIGHT SOURCE



☉ *Aircraft Light Signals:* The use of aircraft lighting systems for night communications may not be practical due to the possibility of enemy detection. However, some general applications of aircraft lighting could be used to signal events, phases, or operational problems during a mission.

■ DAYLIGHT COMMUNICATIONS TECHNIQUES

● *Matrix Boards:* A matrix can be constructed with the numbers 0 through 9 running horizontally and vertically. The combination of vertical and horizontal lines provides a possibility of 100 codes. Each set of two numbers would signify a word, phrase, sentence, or numbers. Once the codes have been assigned per unit SOP, copies of the matrix would be picked up with the CEOI prior to each mission.

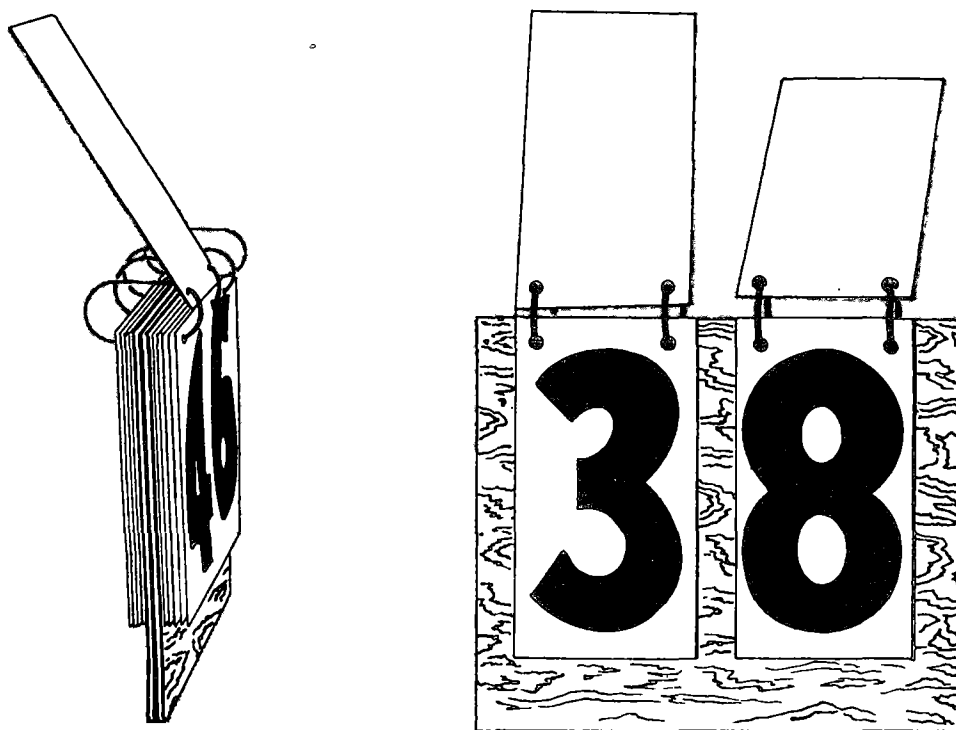
EXAMPLE OF A CODED MATRIX (Fill In Per Unit SOP)

9									
8	Land	Return to base	Form achelon left	Form achelon right	Land in trail formation				
7	LZ cold	LZ hot	Use alternata LZ						
6									
5	What is fuel status?	What is ammo status?	Fuel + 700 lbs	Fuel + 500 lbs	Fuel + 300 lbs	Fuel vary low	Ammo good	Ammo low	
4									
3	Friendly tanks	Friendly troops	Friendly fast movers						
2									
1	Enemy tanks	Enemy troops	Enemy fast movers						
0	Radios jammed	UHF inop	FM inop	Switch to alternata UHF	Switch to alternata FM				
	0	1	2	3	4	5	6	7	8 9

Communications boards could be constructed for each aircraft similar to a 16-inch by 10-inch notebook binder. Inside would be side by side 8-inch by 10-inch cards with the numbers 0 through 9 on them. Use of the card boards would be limited to line-of-sight. The cards can be read at approximately 100 meters with the naked eye, and 500 meters with the Cobra telescopic sight unit (TSU). Such a card folder could also be

arranged with colored cards, letters, or a combination of colors, letters, and numbers. A matrix could also be used in conjunction with arm and hand signals.

AIRCRAFT MATRIX BOARD

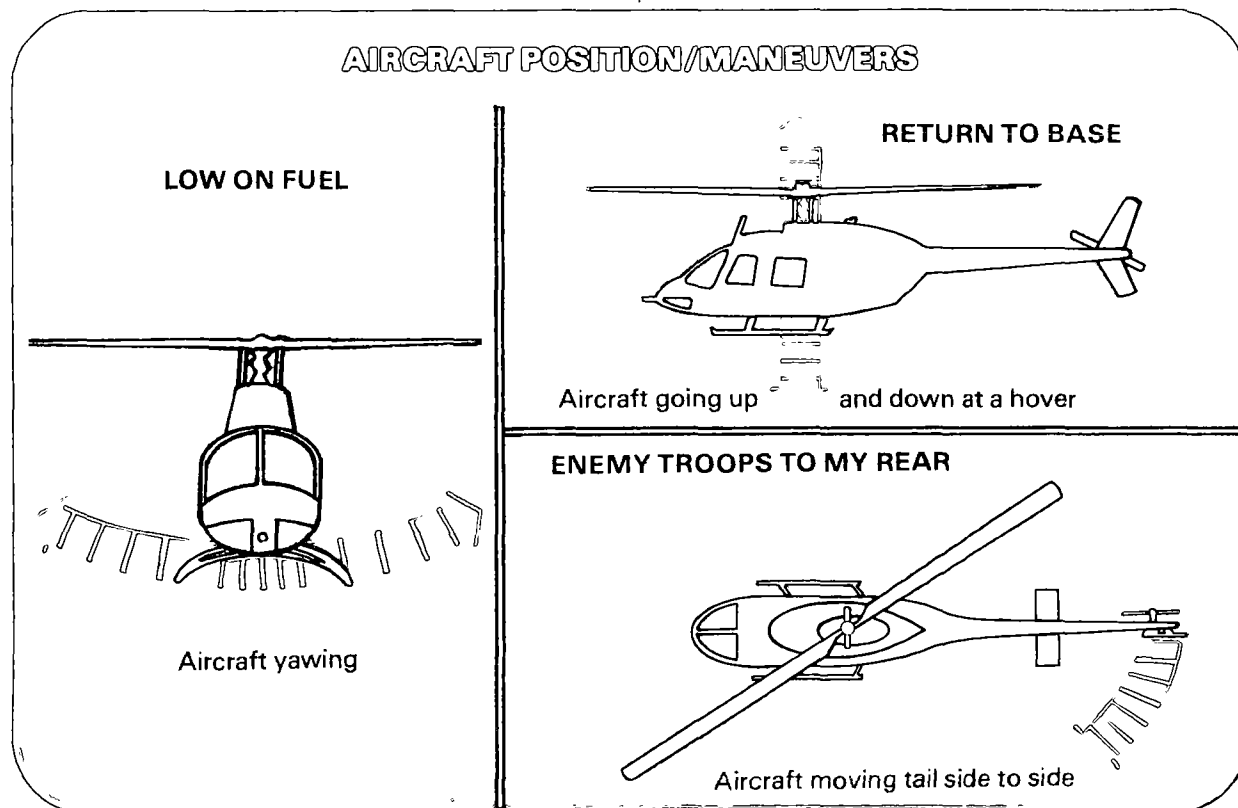


○ *Colored Pennants:* The navies of the world have communicated for many years by means of color-coded pennants. Use of such pennants would not be practical in numerous quantities carried aboard an aircraft, however, a few colors or color combinations in conjunction with arm signals may provide a general limited use. The pennant(s) could be used to communicate events or phrases during a mission. Pennants would generally be more visibly interpreted than other means, but still require line-of-sight.

○ *Smoke and Pyrotechnics:* The use of smoke and pyrotechnics has numerous disadvantages. Therefore, it is suggested that usage be limited to signal general events such as to attack, withdraw, refuel, rearm, or meanings of this type.

○ *Permission Planning and Coordination:* Proper coordination with the supported unit/commander and unit briefings can eliminate the requirement for extensive radio communications. Permission planning and briefings are discussed in detail in chapter 8. If all concerned aviation unit and/or maneuver unit personnel know what the mission, scheme of maneuver, and team/individual responsibilities entail, decentralized operations are greatly enhanced.

○ *Aircraft Position/Maneuver:* A system of codes and phrases could be worked out in relation to aircraft position and maneuver. Some examples are illustrated below. Additional maneuvers should be developed per unit SOP.



○ *Hand and Arm Signals:* The use of hand and arm signals provides the distinct advantage that no extra equipment is necessary. The disadvantages are that they require line-of-sight and can be seen at limited distances. Arm and hand positions are used to relay predesignated (per unit SOP) phrases, sentences, or numbers. Illustrated below are a few examples.



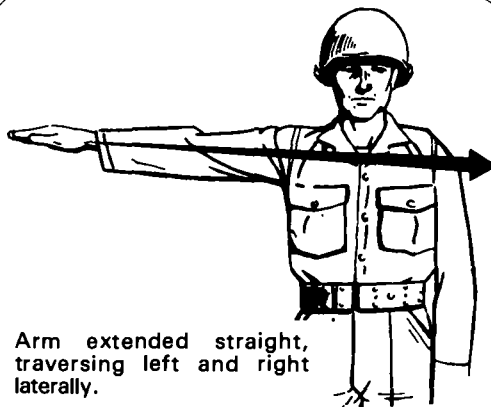
Hand over mouth.

CANNOT TRANSMIT



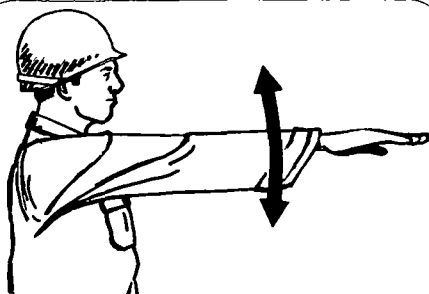
Hand over ear.

CANNOT RECEIVE



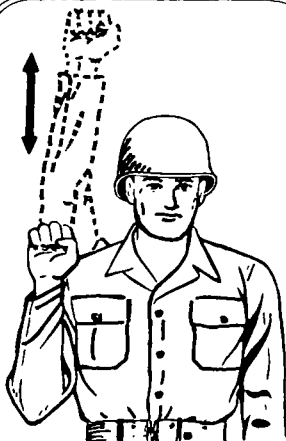
Arm extended straight, traversing left and right laterally.

AZIMUTH/
DIRECTION



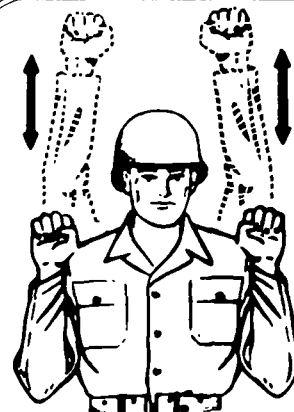
Arm extended straight, elevating and depressing up and down vertically.

RANGE



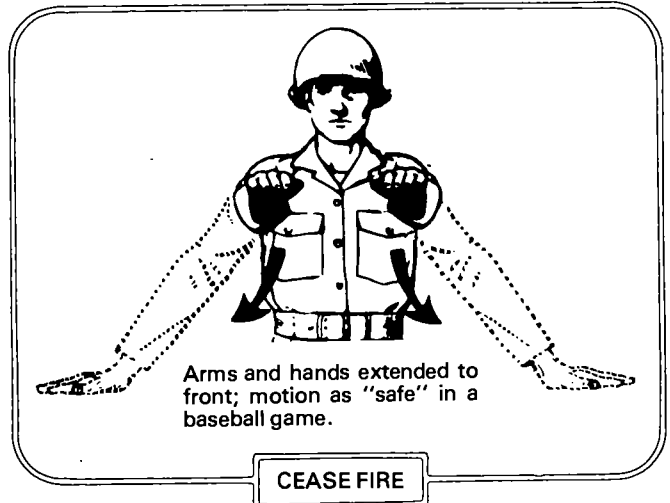
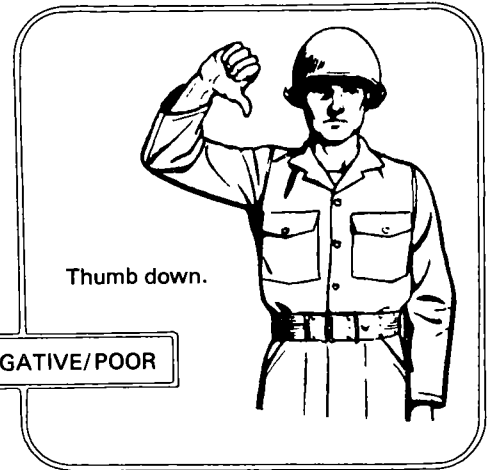
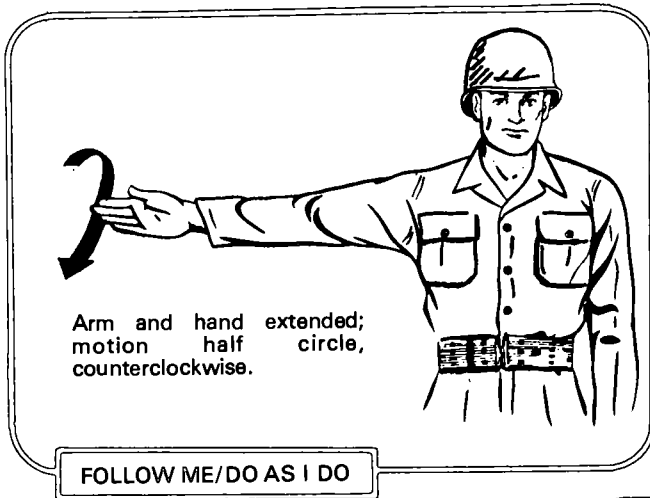
Arm vertical with fist clinched, jerking arm up and down.

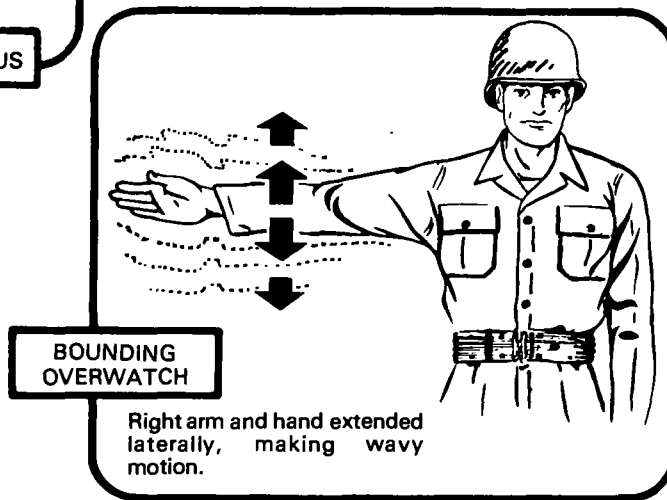
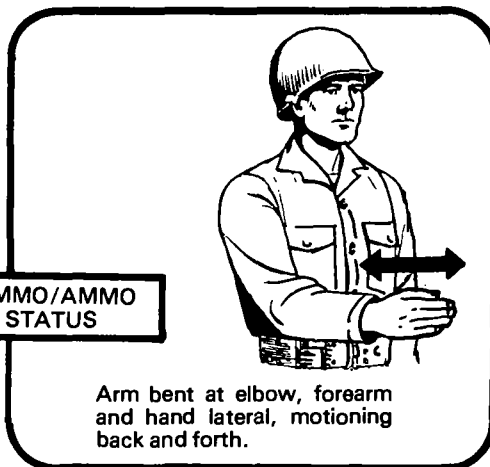
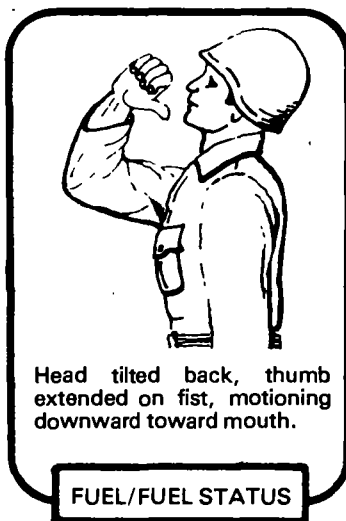
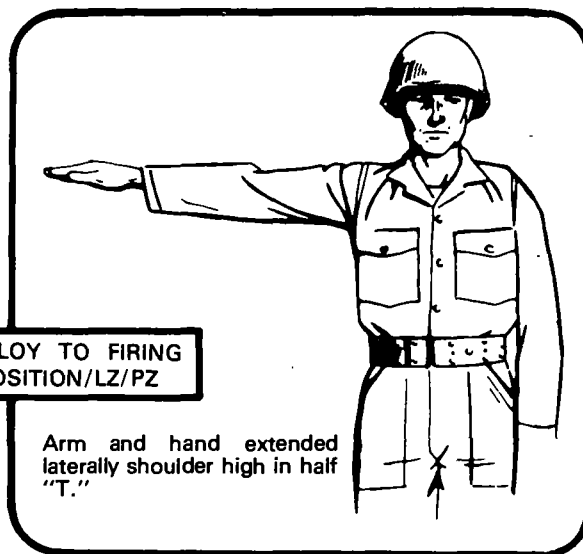
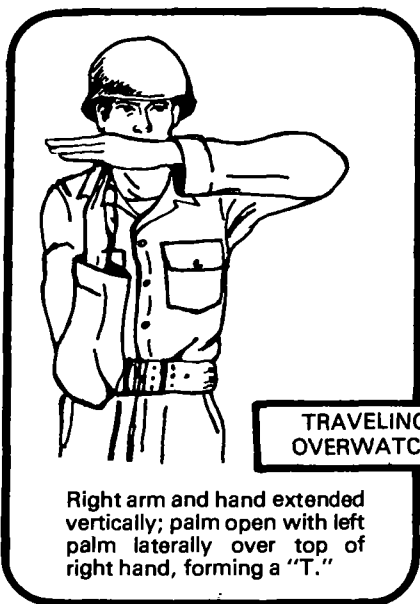
FIRE-AT-WILL

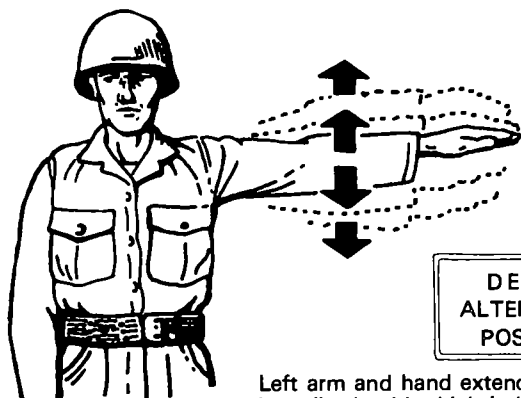


Both arms vertical with fists clinched, jerking up and down.

AT-MY-COMMAND







DEPLOY TO
ALTERNATE FIRING
POSITION/LZ/PZ

Left arm and hand extended laterally shoulder high in half "T," waving up and down.

TARGET



Arms and hands extended in front of body forming an "X."



ENEMY ADA

Elbow bent, hand waving up and down in front of face.



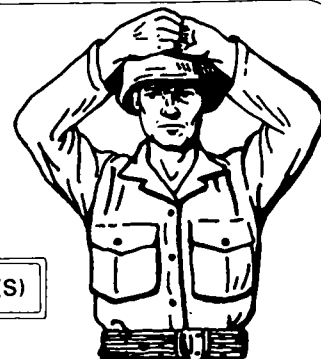
RETURN HOME

Arms and hands extended in front of body forming an angle.



Arms extended laterally from body, elbows bent; forearms and palms extending upward.

RETURN ACP



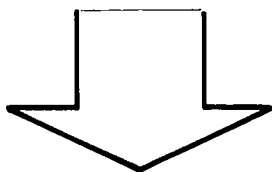
FRIENDLY UNIT(S)

Hands clasped on top of head.

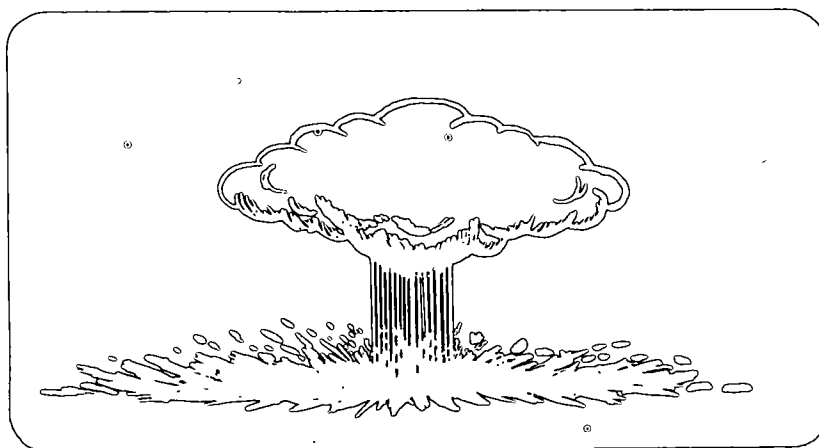
SUMMARY

Aviation unit operations on the high threat battlefield will only be as effective as our planning and training. In order to insure adequate communications are provided on a continuing basis, we must know the EW threat and applicable countermeasures/counter-countermeasures; and we must be able to employ alternate communications means should the use of our radios be denied. The outcome of the battle may well depend on our ability to cope with communications problems. Alternate communications methods presented in this chapter are yet to be solidified. Work on standardized methods continues and will be presented in future texts.

CHAPTER SIX



SURVIVAL OF THE NUCLEAR, BIOLOGICAL, CHEMICAL (NBC) THREAT



THE NBC THREAT

Nuclear, biological, and chemical (NBC) warfare poses substantial hindrances to the successful accomplishment of the aviation mission in the high threat environment. Sophisticated delivery systems for NBC munitions are available to threat forces, and their mobility has been documented.

NBC weapons are viewed by threat forces as weapons of mass destruction. Heavy emphasis is placed on training with these weapons as evidenced by their operations and war games being conducted in a "near real" environment.

The foremost countermeasure to this threat must be the ability to continue operations while subjected to a nuclear, biological, or chemical attack. Our training must be realistic, rigorous, and redundant to achieve a state of readiness in this area. NBC warfare should not stop our ability to fight, survive, and win.

THE NUCLEAR THREAT

In a nuclear environment, frontages are larger and there is more separation distance between units and vehicles. If nuclear fires are used, they will be delivered prior to the nonnuclear preparation. The purpose is to silence the bulk of the enemy's supporting fires and neutralize his forces in contact. A short, heavy preparation, including nuclear fires and air support, usually precedes the commitment of a second echelon army during an attack by a front.

A PRIMARY TARGET FOR ENEMY NUCLEAR IS OUR AVIATION ASSETS

The nuclear delivery means available to threat forces will extend from the forward edge of the battle area (FEBA) to the rearmost boundaries of the theater. These systems include short-range and medium-range ballistic missiles, rockets, aircraft, and possibly artillery. A primary target for enemy nuclear employment will be our aviation assets, since we pose such a formidable threat to their main battle weapon—the tank.

NUCLEAR WEAPONS EFFECTS

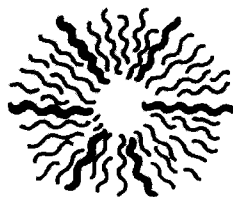
A nuclear detonation results in a fireball formed as the result of the sudden release of an immense quantity of energy. Temperatures inside the fireball range into the millions of degrees, coupled with initial pressure ranges to millions of atmospheres, creating devastating physical changes in the normal balance of the environment. Most of the energy from a nuclear weapons detonation appears in the target area in the form of *blast* and *shock* and *thermal*, and other forms of radiation.

NUCLEAR WEAPONS EFFECTS

BLAST AND SHOCK



THERMAL RADIATION



NUCLEAR RADIATION



○ *Blast and Shock.* Blast and shock account for most of the materiel damage and a considerable number of the casualties after a nuclear detonation. As the intensely hot gases expand within the fireball, the resultant high pressures cause a blast wave to form in the air, moving outward at high velocities. The blast wave is characterized by the abrupt rise in pressure above ambient conditions. The damage mechanisms for airblast result from two areas: *Overpressure* and *dynamic pressure*.

▲ *Overpressure*—As the blast wave reaches an object, such as a helicopter, high initial pressures are applied to the side of the helicopter nearest the burst. Since the side of the helicopter away from the burst is still at ambient pressure, initially there is a temporary pressure difference about the helicopter. As the blast wave envelops the helicopter, the overpressure is applied to all sides of the helicopter and produces a squeezing or crushing force on the helicopter which can result in damage.

▲ *Dynamic Pressure*—Dynamic pressure is a measure of the force exerted by winds associated with the blast wave. The dynamic pressure can cause damage by pushing, tumbling, or tearing targets apart.

▲ *Parked aircraft and aircraft in flight* are damaged by a combination of overpressure and dynamic pressure. Aircraft plexiglass windows are particularly vulnerable to low overpressure effects.

○ *Thermal Radiation.* Thermal radiation results from the heat and light produced by the nuclear explosion within the atmosphere.

DAMAGE OF AIR BLAST RESULTS FROM OVERPRESSURE AND DYNAMIC PRESSURE

CHARACTERISTICS OF THERMAL RADIATION

**TRAVELS AT
THE SPEED
OF LIGHT**

**TRAVELS IN
STRAIGHT
LINES**

**CAN BE
SCATTERED**

**CAN BE
REFLECTED**

**CAN BE
EASILY
ABSORBED**

Thermal radiation changes to heat and may cause injury, damage, or ignition of combustible materials.

Effects on People—Aviation personnel are particularly vulnerable to thermal radiation effects. Normally, two types of injuries can occur.

- ① Thermal burns are produced either directly as flash burns or indirectly by fires caused by the detonation. The nomex flight suit should provide sufficient protection against both types of burns for aviation personnel.

TABLE 5 A

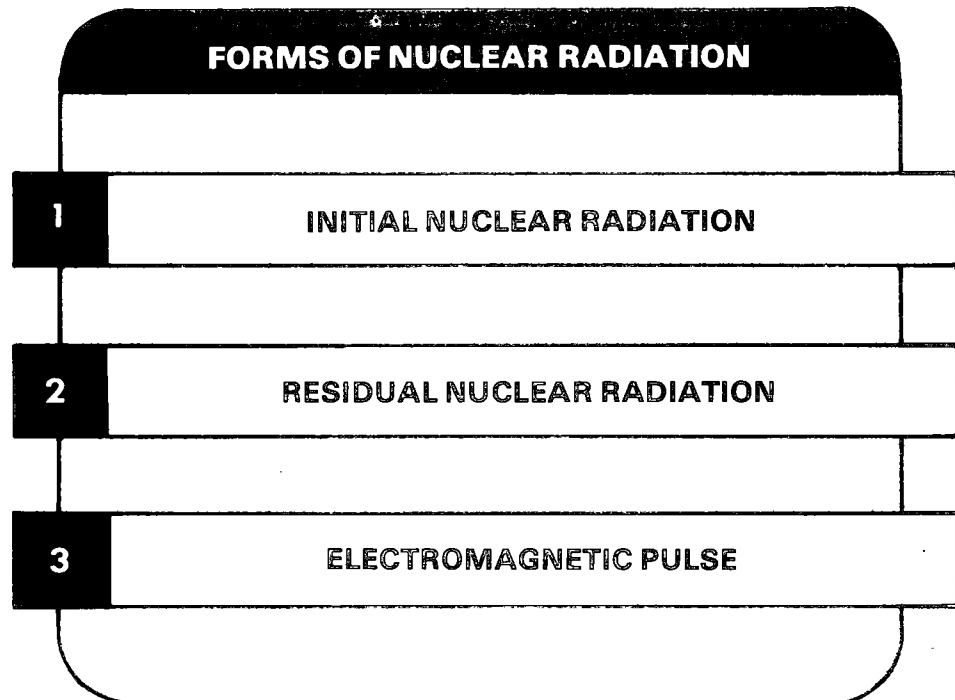
**DAYTIME
VISUAL EFFECTS OF NUCLEAR DETONATION**

ORIENTATION	Eyes focused on point of detonation.	Burst in field of vision but not focused on point of burst.	Personnel shielded or looking away.
FLASH-BLINDNESS	Yes: Recovery in approximately 2 minutes.	Yes: Recovery in less than 2 minutes.	Not very likely.
LOSS OF NIGHT ADAPTATION	N A	N A	N A
RETINAL BURNS	Very likely.	Possible.	No.

② Due to the intense brightness of the flash of light produced by the nuclear explosion, a temporary loss of vision may be encountered. Retinal burns, caused by viewing the fireball directly, are painless and will be rare. Flashblindness is considered a hazard to pilots because of the probability of an aircraft crash if the pilot is temporarily blinded. Due to the majority of operations being conducted at nap-of-the-earth (NOE) flight levels, such crashes could have a significant impact on tactical operations conducted and supported by the extensive use of aircraft.

TABLE 5 B NIGHTTIME VISUAL EFFECTS OF NUCLEAR DETONATION			
ORIENTATION	Eyes focused on point of detonation.	Burst in field of vision but not focused on point of burst.	Personnel shielded or looking away.
◎ FLASH-BLINDNESS ◎	Yes: Recovery gradual in 10 minutes or less. Will depend upon visual task to be performed and level of illumination.	Yes: Recovery in approximately 5 minutes or less for most situations. Depends upon visual task to be performed and level of illumination.	Possible from reflection. Recovery in 2 minutes to 3 minutes for most situations. Depends upon visual tasks to be performed and level of illumination.
LOSS OF NIGHT ADAPTATION	Yes: Recovery gradual in 15 minutes to 35 minutes.	Yes: Recovery gradual in 15 minutes to 35 minutes.	Possible: Recovery in no less than 15 minutes.
RETINAL BURNS	Very likely.	Possible.	No.

● **Nuclear Radiation.** Gamma and neutron radiation from a nuclear detonation produces casualties and materiel damage. Ionized regions, which may interfere with our communication, navigation, and aircraft survivability equipment (radar warning devices, radar jammers, etc.), can be produced by a nuclear burst.



1 Initial Nuclear Radiation. Initial nuclear radiation is defined as that nuclear radiation that is emitted by a nuclear explosion within the first minute after the burst. The primary casualty producers associated with initial nuclear radiation are neutrons and gamma rays. Personnel are extremely vulnerable to initial nuclear radiation and for yields of 50 kilotons (KT) or less, it is the dominant casualty producer.

The individual response to initial nuclear radiation depends upon several factors, including:

- ▲ The total dose received from previous radiation exposure.

- ▲ The periods over which the doses are received.
- ▲ The recuperation time between exposures.
- ▲ The physical condition and age of the individual.
- ▲ The presence of any additional injuries.

2 *Residual Nuclear Radiation.* All nuclear radiation that is emitted from the radioactive particles that a nuclear burst produces after that first minute is called residual radiation. Although this fallout will initially be suspended in the air, the airspace hazard outside the radioactive cloud exists for only a relatively short time, and the radiation hazard to aircraft flying within the area is minimal. However, pilots should avoid flying into the debris cloud since high levels of radiation will be encountered. Likewise, when mission requirements necessitate flying through or into the area of a previous nuclear strike, pilots should be aware of both areas of induced radiation and fallout patterns so they may be avoided, especially in case of emergencies requiring landing of the aircraft. The biological response to residual radiation is the same as the response to initial radiation. The most critical problem encountered by commanders will be to keep accurate account of *total* dosage received by the members of their unit.

**AVOID FLYING INTO
THE DEBRIS CLOUD**

**KEEP ACCURATE
ACCOUNT OF DOSAGE
RECEIVED BY UNIT**

3 *Electromagnetic Pulse [EMP].* An intense electrical field is created by the collision of gamma rays from the nuclear burst and air molecules. The end result is that damage to electrical systems and electronic equipment (radios, navigation systems, radars, etc.) can be encountered. The EMP fields will extend roughly to the safety distances for radiation hazards, but can travel further depending on the height of burst and the yield of the weapon. Although the effects may only be temporary on some equipment, most communications and navigation systems will encounter some interference, with those located closer in to the blast being permanently damaged.

Radiation sickness is the adverse biological response of those exposed to radiation. Since most people will react differently, it is impossible to predict the effect of a specified dose of radiation on any one individual. However, the *average* effect on a large group may be predicted with enough accuracy for military purposes.

TABLE 6

BIOLOGICAL RESPONSE TO NUCLEAR RADIATION

	INITIAL SYMPTOMS	ONSET OF SYMPTOMS	INCAPACITATION	HOSPITALIZATION	FINAL DISPOSITION
0 to 70 RADS	None to slight incidence of transient headache and nausea. Vomiting in up to 5% of exposed personnel in upper part of dose range.	Within 6 hours.	None.	None.	Duty.
70 to 150 RADS	Transient mild headache and nausea. Some vomiting in up to 50% of group.	Approximately 3 to 6 hours after exposure.	None to slight decrease in ability to conduct normal duties in up to 25% of group. Up to 5% of group may become combat ineffective.	Eventual hospitalization (20 to 30 days in upper part of dose range) required for less than 5% in upper part of dose range.	Duty. No deaths anticipated.
150 to 450 RADS	Headaches, nausea and fatigue. Slight incidence of diarrhea. More than 50% of group vomits.	Within 3 hours after exposure.	Can perform routine tasks; sustained combat or performance of complex task may be hampered. More than 5% of group expected to become combat ineffective increasing with increasing dose.	Hospitalization (30 to 90 days) indicated for those in the upper dose range following a latent period of 10 to 30 days.	Some deaths anticipated; probably less than 5% at lower part of dose range, increasing to 50% toward upper end; return to duty questionable in upper dose range.
450 to 800 RADS	Severe nausea and vomiting. Diarrhea. Fever early in upper part of dose range.	Within 1 hour after exposure.	Can perform simple tasks. Significant reduction in combat effectiveness in upper part of dose range. Lasts more than 24 hours.	Hospitalization (90 to 120 days for those surviving) indicated for 100% of exposed personnel. Latent period 7 to 20 days.	Approximately 50% deaths at lower part of dose range, increasing toward upper end; all deaths occurring within 45 days.

BIOLOGICAL RESPONSE TO NUCLEAR RADIATION (CONT)

	INITIAL SYMPTOMS	ONSET OF SYMPTOMS	INCAPACITATION	HOSPITALIZATION	FINAL DISPOSITION
800 to 3,000 RADS	Severe and prolonged vomiting, diarrhea, and fever.	Approximately 1/2 to 1 hour after exposure.	Significant reduction in combat effectiveness. In the upper part of the dose range, some personnel will undergo a transient period of complete combat effectiveness followed by capability for some response until end of latent period.	Hospitalization indicated for 100% of exposed personnel. Latent period of less than 7 days.	100% deaths occurring within 14 days.
3,000 to 8,000 RADS	Severe and prolonged vomiting, diarrhea, fever, and prostration. Convulsions may occur at higher doses.	Within 5 minutes after exposure.	Will become completely incapacitated within 5 minutes and will remain so for 30 to 45 minutes. Will then recover but will be functionally impaired until death.	Hospitalization indicated for 100% of exposed personnel. Latent period of 1 or 2 days.	100% deaths occurring within 5 days.
8,000 to 18,000 RADS	Severe and prolonged vomiting, diarrhea, fever, and prostration. Convulsions may occur at higher doses.	Within 5 minutes after exposure.	Will become completely and permanently incapacitated for performing physically demanding tasks within 5 minutes.	Hospitalization indicated for 100% of exposed personnel. No latent period.	100% deaths occurring within 2 days.
Greater than 18,000 RADS	Convulsions and prostration.	Within 5 minutes after exposure.	Will become completely and permanently incapacitated for performing any task within 5 minutes.	Hospitalization indicated for 100% of exposed personnel. No latent period.	100% deaths occur within 15 hours.

**COUNTERMEASURES
AGAINST THE
NUCLEAR THREAT**

Since the hazards associated with nuclear weapons are so unique, aviation countermeasures are dependent on many elements. For example, for a 1 kiloton detonation, the difference between the distance where you are a certain casualty and the distance where you may assume you are reasonably safe is only 330 meters.

CATEGORIES OF DANGER TO AIRCRAFT AND PILOTS

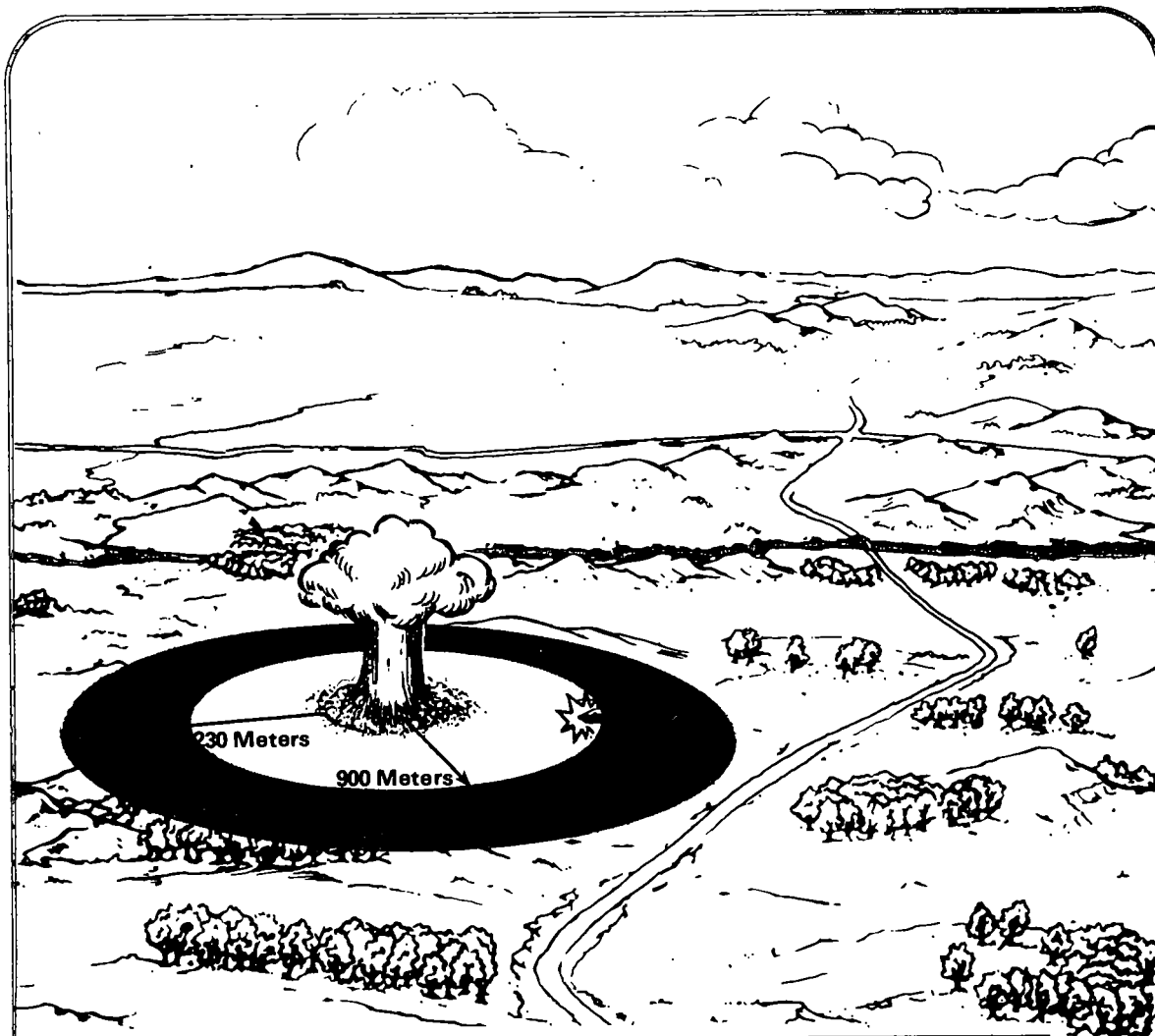

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graph TD; Title[CATEGORIES OF DANGER TO AIRCRAFT AND PILOTS] --- Thermal[THERMAL RADIATION—Either heat or light or the combination of both which can damage the aircraft and burn the pilot.]; Title --- Radiation[RADIATION—The total dose absorbed by the pilot may be incapacitating or lethal.]; Title --- Blast[BLAST—The overpressure and dynamic pressure absorbed by the aircraft may cause structural damage or structural failure.]; Thermal --- Radiation; Radiation --- Blast; Thermal --- Blast;
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THERMAL RADIATION—Either heat or light or the combination of both which can damage the aircraft and burn the pilot.

RADIATION—The total dose absorbed by the pilot may be incapacitating or lethal.

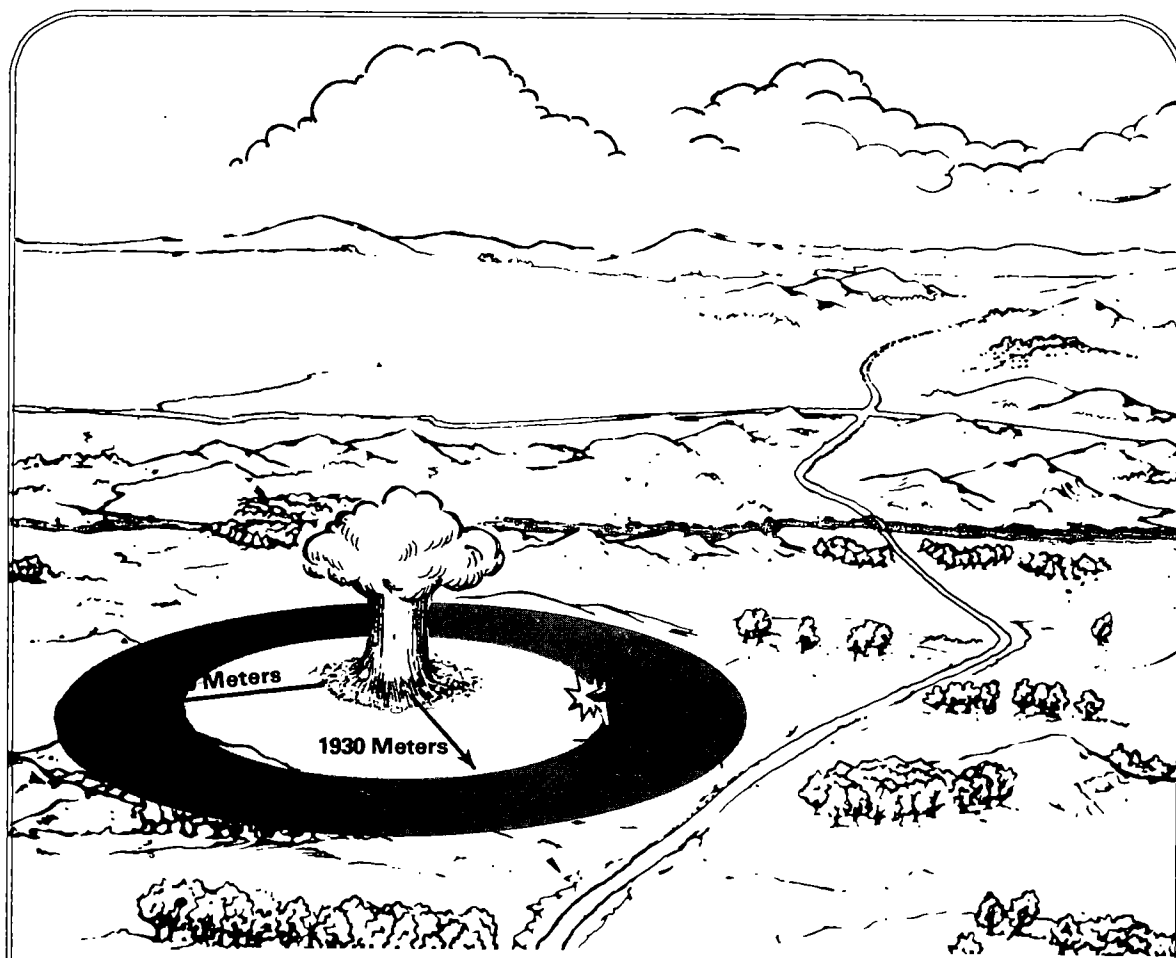
BLAST—The overpressure and dynamic pressure absorbed by the aircraft may cause structural damage or structural failure.

Two samples of circular patterns describing at what distance the aircraft and the pilot are susceptible to damage and at what distance both are safe follow. For the purpose of simplification, radiation dosages and overpressures are the overriding concerns, since pilots and crewmembers are protected against thermal burns by their nomex flight suits and gloves.



NUCLEAR EFFECTS	ABORT (900 METERS)	
*Radiation dose	1600 rads	
Pressure	6 pounds per square inch (psi)	
*Thermal	7 calories/centimeter per square inch (cal/cm ²)	
*Lethal/Incapacitating		

FIGURE 6-1. NUCLEAR EFFECTS ON ARMY AIRCRAFT OF A 1-KILOTON NUCLEAR DETONATION.



NUCLEAR EFFECTS	ABORT (1930 METERS)
Radiation dose	12 rads
Pressure	2 psi
*Thermal	12 cal/cm ²
*Lethal Implications	

FIGURE 6-2. NUCLEAR EFFECTS ON ARMY AIRCRAFT OF A 10-KILOTON NUCLEAR DETONATION.

As is evident from the two preceding illustrations, you can fly a lot closer to a nuclear burst than you had previously thought possible.

● *Actions Prior to a Nuclear Detonation.* The single most important element of our defense against a nuclear attack will be the efforts of our intelligence community to forewarn friendly units of the possibility of threat force employment of nuclear weapons. Once the threat has been ascertained, certain defensive measures may be employed. These measures are to be considered consistent with the threat, and need not be employed simultaneously.

▲ **Command Emphasis**—Commanders must insure that aviators and support personnel have the proper protective equipment and are proficient in the use of this equipment.

▲ **Detective Equipment**—All monitoring, warning, and detection equipment must be fully operational and in the hands of capable operators.

▲ **Medical Treatment**—First-aid procedures for nuclear-associated injuries should be reviewed and provisions planned for medical evacuation (medevac) procedures. Plans for local treatment of minor wounds should be understood by all members of the unit.

● *Actions During a Nuclear Attack.* Due to the shock effect of the nuclear blast, aviators must take certain actions immediately.

▲ **If flying, put the helicopter down!** You will only have a few seconds to reach to ground before the shock wave reaches you! Don't panic and be alert of aircraft damage due to tree strikes or hard landings. Alter your rate of descent. Your chances of survival are much better when you are on the ground. If possible, when descending, point your nose at the burst to present less of a frontal area for the blast wave to strike upon. As the aircraft rests on the ground, put your visor down; and place your head as low as conditions permit, while maintaining control of the aircraft. After the blast wave passes, check the aircraft for structural damage and, if possible, return to home station.

▲ **Fixed-wing aircraft** should fly away from the blast. By flying away from the blast, radiation, thermal burns, and blast damage should be diminished.

FOREWARN FRIENDLY UNITS

CHANCES OF SURVIVAL ARE BETTER ON THE GROUND

▲ Personnel who are on the ground should assume the prone position, face down, covering exposed areas of their body as best possible. As in aircraft, personnel should face away from the blast and present a perpendicular angle of incidence to the blast wave.

PROTECTIVE MEASURES FOR DISMOUNTED PERSONNEL

The measures illustrated below provide protection against the initial effects of nuclear weapons, to include blast, heat, and nuclear radiation. Deep, covered foxholes or deeply buried culverts offer the best protection against fallout.

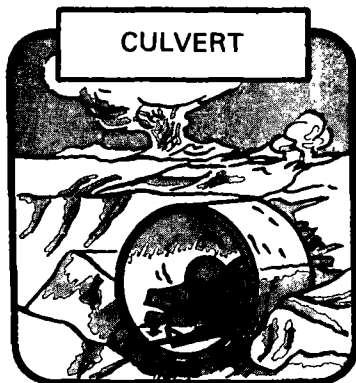
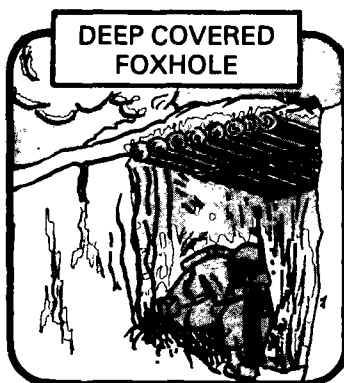
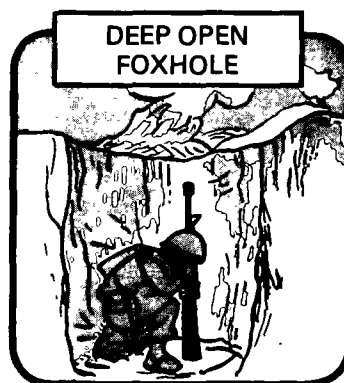
HILL



DITCH



CULVERT

DEEP COVERED
FOXHOLEDEEP OPEN
FOXHOLE

○ *Actions to be Taken After the Nuclear Attack.* The most catastrophic consequence of a nuclear burst can be the negative psychological effects on soldiers. Calm, effective, and

intelligent leadership will overcome the inherent fear most soldiers will experience.

As soon as the blast wave has passed, radiological monitoring should commence to prevent radiological contamination of equipment and personnel. Radios will possibly be affected by EMP. Unit commanders should be prepared to carry out their assigned missions in radio silence. Therefore, operational plans should include provisions for mission continuation even without radios.

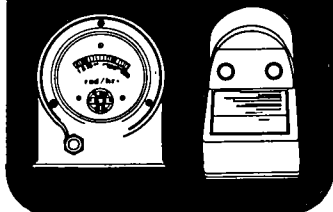
▲ **Aircraft and Vehicle Decontamination**—The most practical method of aircraft and vehicle decontamination is to use water to remove the radioactive material. Detergent may also be added, but care must be taken to control the runoff of water, because it will become contaminated. Refer to Technical Manual 3-220 for a more comprehensive discussion of decontamination procedures. Remember, radioactive material cannot be destroyed.

**RADIOACTIVE MATERIAL
CANNOT BE DESTROYED**

▲ **Radiological Monitoring**—(RADIAC) instruments are used to detect nuclear radiation and are available in all aviation units. Radiological monitoring of the unit area alerts the commander to a hazard that would otherwise go undetected.

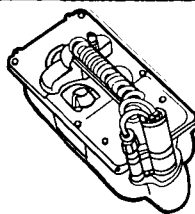
STANDARD INSTRUMENTS AVAILABLE IN THE AVIATION COMPANY

IM-174A/PD.



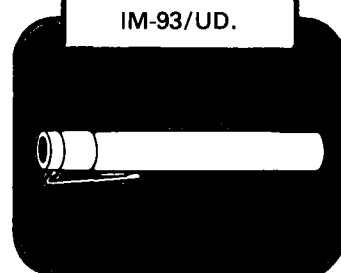
A standard ion-chamber RADIAC meter used for area monitoring and survey. It measures rad per hour cumulative dosage rate and is issued on a one per platoon basis.

AN/PDR-27.



A portable radiation detector used for area monitoring and survey. It measures rad per hour cumulative dosage rate and is issued on a one per platoon basis.

IM-93/UD.



An individual dosimeter designed to measure the total nuclear radiation (gemme) dose received by individuals. These dosimeters are recharged by the PP-1578/PD.

THE BIOLOGICAL THREAT

Disease has proven to be a formidable antagonist, determining the outcome of many battles. Biological warfare cannot be discounted as an option to the threat forces. Any method which appears to offer advantages to a nation at war may be vigorously employed by that nation. Biological weapons systems possess mass casualty potential which cannot be safely ignored since threat doctrine treats their use as an integral part of warfare.

Biological weapons systems are unique in that the agents involved are alive or the toxic products of living organisms. Only a small number of micro-organisms are needed to inflict casualties. The agents reproduce in the host and bring about disease. The area covered by biological weapons systems can be up to many thousands of square kilometers. Biological agents do not produce casualties immediately because time is required to overcome the body's internal defense mechanisms.

COUNTERMEASURES AGAINST A BIOLOGICAL THREAT

Biological agents can be delivered in various forms, chiefly by spray and by bomblets.

BE SUSPECT OF A BIOLOGICAL ATTACK IF—

1	Low flying aircraft appear to produce a mist or spray.
2	A munition is delivered by enemy aircraft that has no apparent explosive impact.
3	Unusual bomblets are found.
4	Numerous unexplained ill personnel are observed.
5	Unusual swarms of insects are observed, such as mosquitoes, suddenly appearing after aircraft have dropped containers that do not have an immediate effect.
6	Numerous sick or dying animals become apparent.

● *Protection Against Biological Agents.* The protective mask is effective against aerosol delivery and spraying, while individual immunization is most effective against airborne vectors such as mosquitoes. It would be unlikely, however, for threat forces to employ the use of airborne vectors since their movement is unpredictable after release.

● *Decontamination of a Biological Agent.* Individual decontamination measures usually are not necessary if the agent has been dispensed by aerosol means. Other delivery methods may require decontamination which can be accomplished by showering and the use of germicidal soaps for individuals. Hot soapy water is the best decontaminant for aircraft and associated equipment.

**PROTECT YOURSELF
WITH**

- MASKS
- IMMUNIZATIONS

THE CHEMICAL THREAT

The threat forces have chemical munitions incorporating phosgene, chlorine, mustard, lewisite, hydrocyanic acid, and cyanogen chloride. Chemical munitions are available for surface-to-surface missiles, multiple-rocket launchers, artillery, and aircraft munitions. Threat doctrine describes chemical agents as "weapons available to the commander," and threat forces are well equipped to wage both offensive and defensive operations in a chemical environment.

Additionally, threat forces have various chemical delivery means ranging from mortars to supersonic aircraft. These systems can deliver both persistent and nonpersistent agents either by airburst or surface burst, depending on the agent used.

Chemical staff personnel are assigned down to the battalion level, while organic chemical decontamination units are present from the front level down to the regimental level.

○ *Types of Chemical Agents.*

▲ **Nerve Agents**—Nerve agents directly affect the nervous system and are highly toxic in liquid and vapor form.

● **Physiological Effects**—Runny nose, tightness of the chest, difficult breathing, excessive perspiring, drooling, nausea, vomiting, dimness of vision, pinpointing of the pupils, convulsions, and eventually death.

**MOST NERVE
AGENTS ARE**

- ODORLESS
- COLORLESS
- TASTELESS

● **Characteristics of Nerve Agents**—Nerve agents are generally odorless, colorless, and tasteless. They are quick acting when inhaled, with some symptoms developing in 1 to 2 minutes after inhalation.

▲ **Blister Agents**—Blister agents affect the eyes, lungs, and skin. Some types are painless, while others sting.

● **Physiological Effects**—Burning and blistering on any part of the body they contact. A droplet of mustard type agent the size of a pinhead may produce a blister 1 inch in diameter. When blister agents contact the eyes, redness, inflammation, and frequently temporary blindness occur. If inhaled, blister agents cause serious damage to tissues in the mouth, nose, throat, and lungs.

● **Characteristics of Blister Agents**—Some blister agents are odorless, while others have the faint smell of garlic or horseradish. If used in droplet form, they range from colorless to dark brown oily liquid drops.

▲ **Blood Agents**—Blood agents are usually dispensed as vapors or aerosol and are ingested into the body by breathing.

● **Physiological Effects**—Blood agents affect the respiratory and circulatory systems by preventing the use of oxygen in the blood by the body cells. Symptoms are convulsions, leading to a coma. Unconsciousness follows; and with a high enough concentration, death.

● **Characteristics of Blood Agents**—Blood agents are colorless as gases and may have a faint odor of peach kernels.

● ***Mission-Oriented Protective Posture [MOPP]***. Since the threat of chemical warfare must be considered during all future military operations, certain protective measures must be readily available to the commander. *Mission-oriented protective posture* is a system of progressive protective measures designed to permit the maximum comfort, mobility, and protection in accordance with the enemy threat. Due to the inherent discomfort and heat buildup associated with wearing of the protective equipment and clothing, MOPP was designed to facilitate work operations in a threatened or actual chemical environment. For a full discussion of MOPP, refer to FM 21-40.

COUNTERMEASURES AGAINST CHEMICAL WARFARE

● ***Individual Actions Prior to a Chemical Attack***. Since aviators will be required to move rapidly about the high threat battlefield, *alertness* and *proficiency* are key words in protection against chemical warfare.

▲ **Alertness**—Since chemical weapons use may be initiated without warning, particular attention should be stressed in premission planning on the possibility of encountering a chemical environment.

**ALERTNESS AND
PROFICIENCY ARE
ESSENTIAL AGAINST
CHEMICAL WARFARE**

▲ **Proficiency**—Aviators must possess and understand their chemical protective equipment. Practice with and confidence in the protective clothing will provide the impetus necessary to overcome any discomfort encountered.

⊗ *Chemical Protective Equipment.*

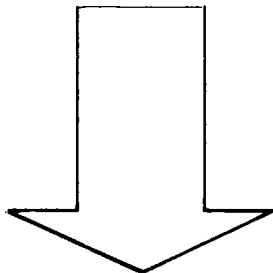
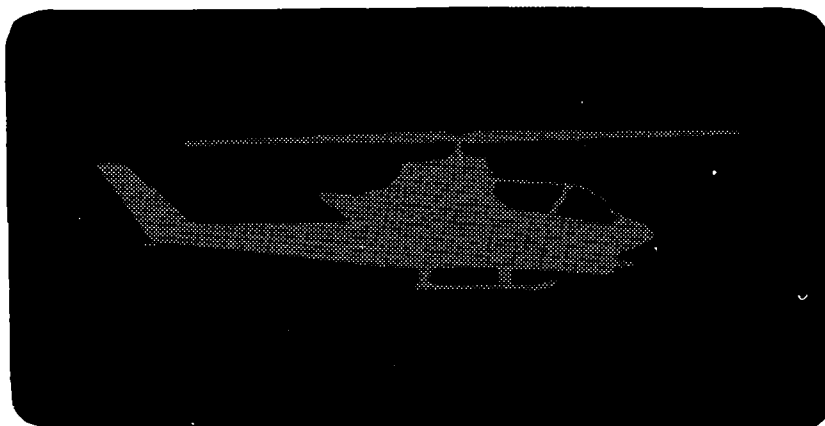


▲ ABC M-24 Mask—The aviator protective mask ABC M-24 is used to protect the aviator against known chemical, biological (CB), and riot control agents. It does not protect the wearer from ammonia or carbon monoxide fumes. An M-2 anti-glare eyelens outsert is provided with the ABC M-24 mask since the sun visor of the protective flying helmet cannot be used with the mask. The mask can be attached to the aircraft oxygen supply system by the use of an M-8 adapter kit. Accessories include the M-7 aircraft protective mask hood and a winterization kit. The hood is attached to the mask by the faceplate. For further discussion of the ABC M-24, refer to TM 3-4240-280-10.

▲ Chemical Protective Clothing—The normal protective clothing the aviation unit can expect to wear will be the standard-A chemical protective liner ensemble. This ensemble consists of one shirt liner and one trouser liner, three pairs of cushioned sole socks, and one pair of cotton gloves inside a clothing bag. The shirt and trouser liners have been treated (impregnated) with XXCC3 impregnate to give protection against vapors, aerosols, and small droplets of nerve and blister agents. They are worn under the nomex flight suit and can be washed or decontaminated and then re-treated with impregnate.

SUMMARY

The aviator operating on the high threat battlefield must be vigilant, both mentally and physically, to detect the possible use of NBC weapons by threat forces. Since war has traditionally forced man to resort to weapons systems which inflict mass casualties, threat forces must be expected to use these weapons when it will serve their means. Mission-oriented protective posture will assist in preparing friendly forces for all contingencies, while insuring that a constant state of readiness is maintained in consonance with the threat. Finally, should NBC hostilities commence, confidence in our protective equipment and adherence to prescribed defensive procedures will assure our aviation assets the ability to fight, survive, and win!

CHAPTER SEVEN**ARMY AVIATION OPERATIONS
DURING PERIODS OF REDUCED
VISIBILITY IN THE HIGH THREAT
ENVIRONMENT****REDUCED VISIBILITY CONDITIONS**

Threat doctrine, training, and equipment capabilities demand that US forces be capable of conducting sustained combat operations on a 24-hour basis regardless of weather conditions. Technological advances in night vision and reduced visibility aids will soon make sight ranges equivalent to weapons ranges and increase maneuver speeds equivalent to daylight operational capabilities.

A decisive tactical advantage can be gained by one force over another force if it is better equipped and trained to operate during periods of reduced visibility. As members of a numerically inferior force, we must maintain every advantage in order to win the battle.

Combat operations during periods of reduced visibility include:

- ☐ Night operations.
- ☐ Reduced visibility due to meteorological conditions—rain, snow, fog, haze, clouds,
- ☐ Reduced visibility due to combat operations—smoke, dust.

The task force and aviation unit commander must carefully weigh the employment decisions of aviation assets according to:

- ☐ Equipment capabilities.
- ☐ Training proficiency.
- ☐ Ceilings.
- ☐ Visibility.
- ☐ Mission urgency.

THREAT EMPLOYMENT TACTICS AND TECHNIQUES

Threat forces are skilled at night fighting and conducting combat operations during periods of reduced visibility. They take advantage of periods of reduced visibility to press the attack trying to achieve surprise; bypass defensive positions; and destroy and disrupt command, control, and support systems.

Round-the-clock operations are habitual to maintain the uninterrupted momentum of the offensive.

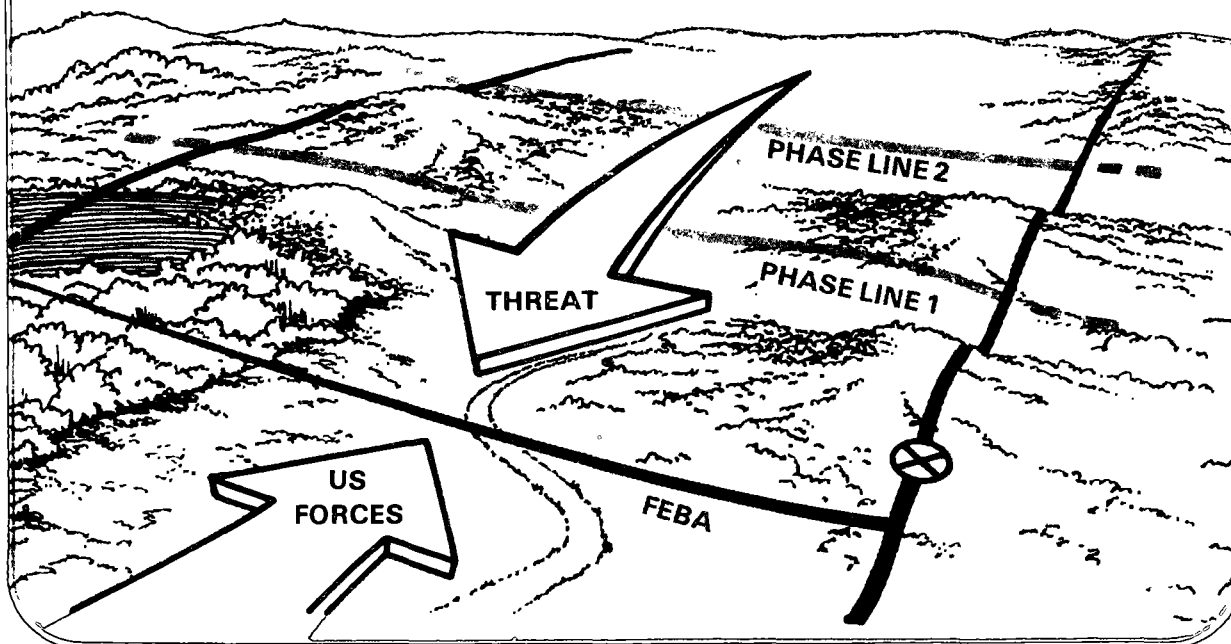
Objectives for night attacks, unsupported by nuclear fires, may be as deep as 8 kilometers to 15 kilometers.

THE ATTACK

Preparations for night attacks are made in detail. Plans are based on careful reconnaissance, simplicity of maneuver, speed of execution, and surprise. Two phase lines are selected. The first is located within the enemy forward defense area and is used to regroup assault teams and establish coordination with supporting artillery for the attack of the next objective. The second phase line is selected so that its capture will force the enemy to displace its division artillery.

Timing for the attack is planned to achieve surprise when enemy forces might least expect it or when enemy forces may be relaxed after a hard day of fighting. An attack may also be planned a few hours before dawn to permit exploitation of success during daylight hours.

Motorized rifle battalions normally attack in a single echelon, supported by tanks, and preceded by a small advance guard. Companies are deployed in a line of platoons. If the assault zone is narrow (500 meters to 600 meters), a battalion may attack in two echelons. The second echelon would then consist of a reinforced company used to protect the battalion flanks. To achieve surprise, artillery preparations are not often used. Illumination is used for identifying deep objectives and to mark most important targets for artillery and tactical (tac) air support. Care is taken so as not to illuminate organic forces or interfere with night vision equipment.



THE DEFENSE

The night defense is organized much the same as the daylight defense—in echelons with a safety zone and a main defensive belt. To guard against enemy night counterattacks, reconnaissance is intensified along the flanks and to the front. Continuous illumination of terrain along all probable approach axes is utilized.

THREAT NIGHT VISION CAPABILITIES

Most threat night vision devices are infrared. These include:

- ① **WEAPONS SIGHTS**
- ② **SURVEILLANCE DEVICES**
- ③ **DRIVING AIDS ON ALL VEHICLES**
- ④ **SNIPER SCOPES**
- ⑤ **INTRUSION ALARM DEVICES**
- ⑥ **METASCOPIES**

Night observation equipment, organic to both tank and motorized rifle units, makes full integration possible of all combat weapons and vehicles.

The following are guidelines of threat night vision capabilities.

TABLE 7		THREAT NIGHT VISION AIDS	
EQUIPMENT	INDIVIDUAL/ CREWMEMBER	**RANGE	SOURCE
*Tanks T54, T55, T62, T10	Commander Gunner Driver	400-500m 800-1000m 40m	ACTIVE INFRARED
Mechanized vehicles BMP, BRDM, BTR, AACV	Commander Gunner Driver	400m 800m 40m	
Air Defense ***ZSU-23-4 (23mm) ZSU-57-2 (57mm)	Commander Driver	400m 40m	
Artillery, self-propelled [SP]	Commander Gunner Driver	400m 1000m 40m	
Towed	Gunner	1000m	
Observation posts	Observer	1300m	
Small arms	Sniper Machine-gunner	300-400m 300-400m	
*Tank gunners using the infrared searchlight can see out to 1000m directly in line with the main gun, but not to the sides. The tank commander has a separate infrared searchlight which allows independent scan out to 500m. **Range dependent on ambient light level. Ranges given are maximum effectiveness. ***Radar engagement ranges are not affected by light level or meteorological conditions. ZSU-23-4 is still 3000m; S-60, 6000m. Radar-guided missile ranges are still the same.			

COUNTERMEASURES DURING PERIODS OF REDUCED VISIBILITY

Generally speaking, US Army night vision/reduced visibility aids are superior to those used by threat forces. This advantage should be capitalized upon to increase Army aviation combat effectiveness. In the final analysis, the crux of the present opportunity boils down to training proficiency. It must be remembered, however, that training utilizing night vision equipment and in employing tactical instrument flight should be conducted by qualified unit personnel and under strict control measures as set forth by training objectives and parameters in chapter 9 and selected references.

Tactics used during periods of reduced visibility will not change. However, available equipment and effective use of that equipment must be grasped.

□ ACTIVE COUNTERMEASURES

○ *Suppression by Fire:* Suppression by fire can cause tank and mechanized infantry/artillery vehicles to button-up, thus degrading their night vision equipment to the driver and gunner. This will degrade their field of view and enhance flanking engagements by attack helicopters on their blind sides.

Suppress radar-guided, antiaircraft artillery/missile systems first in an attempt to destroy them or render their radar ineffective. Then concentrate on weaker weapons systems that are at an optical disadvantage.

USING SMOKE AT NIGHT CAN CREATE VISION PROBLEMS FOR OUR OWN FORCES

○ *Suppression by Smoke:* Suppression by smoke degrades infrared optical devices and impairs normal vision. However, for night combat, the use of smoke must be judiciously weighed because it can also create vision problems for our own forces. When helicopters are employed at standoff ranges, there is little advantage gained at night because they are already out of threat visual range.

○ *Illumination:* Illumination can provide a better optical view of enemy maneuvers and forces, render enemy infrared night vision devices ineffective, and temporarily blind enemy forces' night vision capability. Illumination employment systems available to the aviator include mortars, artillery, and

the attack helicopter M257 illumination warhead adapted to the 2.75-inch, folding-fin, aerial rocket (FFAR). (The helicopter-delivered Mk-45 drop flare is not discussed as the threat probably will make its use unfeasible.)

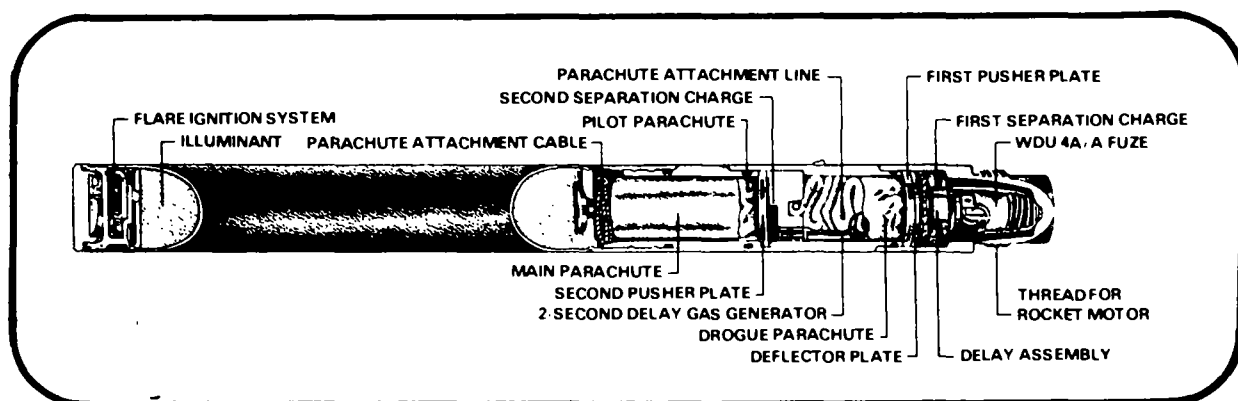
▲ The proper use of illumination flares (helicopter, artillery, and mortar) requires experienced and well-trained observers to preclude the illumination, skylining, or blinding of friendly forces.

▲ Procedures for requesting and adjusting artillery and mortar illumination are similar to adjusting other types of artillery fires, except that in the request of fire, the number of guns and shells must be specified.

▲ In the adjustment, the height of burst must be adjusted up or down so the flare burns out as it hits the ground. The point of burst must be moved forward or back (drop or add), left or right in accordance with wind conditions so the target receives maximum illumination time. For illumination/targeting purposes, the flare should be adjusted behind the target to get a skyline effect of threat forces. For sight degradation/blinding purposes, the flare should be located to the front of the target.

▲ For use by attack helicopters, the M257 illumination warhead has been developed for the 2.75-inch, folding-fin, aerial rocket system. This system is expected to become available by late 1978.

**WELL-TRAINED
OBSERVERS ARE
ESSENTIAL IN THE
PROPER USE OF
ILLUMINATING FLARES**



In addition, research and testing is currently underway for a combined stores management with remote fuze setting capability to employ with the illumination warhead. This will enable standoff employment ranges from 1500 to 6000 meters. Availability is projected for 1980.

TC 1-16, *Employment of Aircraft Flares From Army Aircraft*, contains complete tactical and technical data for use of the M257 illumination warhead.

**MANEUVERABILITY WILL
BE DIRECTLY AFFECTED
BY REDUCED VISIBILITY**

○ *Radar and Infrared Jammers.* The effective use of these systems is most important during periods of reduced visibility. Maneuverability and visibility will be directly affected by reduced visibility operations. Radar jammers are required to counter radar directed threat air defense systems. Chaff would be used in conjunction with evasive maneuvers upon radar warning receiver indication. Infrared jammers should be turned on when atmospheric conditions are conducive to infrared acquisition.

□ PASSIVE COUNTERMEASURES

● *Nap-of-the-Earth [NOE] Flight Techniques.* These will be used to even a greater advantage during periods of reduced visibility. However, due to visibility limitations, airspeed will have to be reduced accordingly. As a result of reduced airspeed, power limitations and loads will have to be checked closely to insure flight safety. Formations will have to be adjusted to insure flight safety. Command and control procedures will also be more difficult unless careful preplanning is executed.

○ *Standoff Distances.* The standoff distance with the unaided eye during periods of reduced visibility will decrease. For this reason, commanders should carefully evaluate the use of attack helicopters for reduced visibility missions. However, with the AN/PVS-5 night vision goggles, a significant advantage can be gained in attack helicopter night operations due to visibility capabilities.

○ *Vulnerability Reduction Equipment.* Vulnerability reduction equipment, as discussed in previous chapters, will aid survivability during operations in any environment.

● *Aircraft Survivability Equipment [ASE]*. ASE will be utilized in the same manner during periods of reduced visibility. However, timing for use of chaff and flare dispensing with the XM-130 dispensing system will rely much more on indications from the radar warning receiver or missile launch/approach indicator. Reduced visibility will limit visual acquisition of a missile or a gun system in flight or being fired at you. Chaff should be dispensed on indication of being tracked. This will disguise your aircraft on the radar screen or cause the gun/missile system to lock on the chaff cloud long enough to maneuver to mask or destroy the system by suppressive tube-launched, optically tracked, wire-guided (TOW) or Hellfire missile systems. Remember, exposure time for attack helicopters from unmask to remask will not exceed 37 seconds against radar-guided weapons systems.

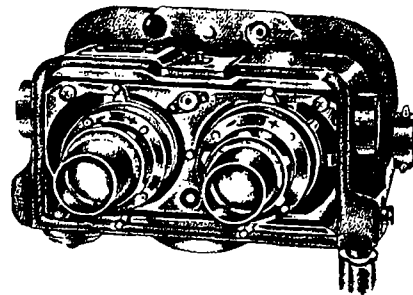
**UNMASKED EXPOSURE
TIME WILL NOT EXCEED
37 SECONDS**

■ THE AN/PVS-5 NIGHT VISION GOGGLES

*REDUCED VISIBILITY
EQUIPMENT AIDS*

Night vision goggles will significantly improve Army aviation night operations in a high threat environment. Night vision capabilities under low to medium ambient light levels enable detection of:

- Personnel-----400 meters
- Vehicles/large stationary targets --2000 meters
- Moving vehicles -----3000 meters
- Prominent terrain features-----3000 meters



Under quarter moon to full moon conditions, on a clear night, visibility is greatly increased. Night standoff capabilities against threat forces gives Army aviation reconnaissance and attack helicopters a significant advantage. Blind side (rear/flanking) reconnaissance/attack angles further increase the advantage against threat forces.

When using the goggles, internal lighting should be minimal or off. Of course, external lighting will be off to prevent detection. Because the goggles amplify and regulate ambient light at a constant level, a sudden flash or illumination does not affect the pilot's ability to see. Illumination flares, however, should not be viewed directly as the surrounding visibility will darken. In order to prevent this, view the area under illumination or to the side without looking directly at the illumination source.

For night TOW firing, chapter 1, TC 1-4, *Helicopter Gunnery*, should be consulted for missile guidance techniques. For training purposes, only AN/PVS-5 qualified instructor pilots should be used due to limiting factors that require a high level of training proficiency for safe use.

LIMITING FACTORS IN THE USE OF AN/PVS - 5 GOGGLES

- The field of view with the goggles on is limited to 40 percent. Therefore, a wide field scan technique must be developed to compensate for peripheral vision loss. Sideward hover and night formation flight can be extremely dangerous to an improperly trained crew.
- Fog, haze, smoke, clouds, and small wires are not detectable with the goggles. Therefore, night flight under adverse weather conditions could be fatal to the untrained crew should it inadvertently go instrument meteorological conditions (IMC) with no lights on in the cockpit. Good premission terrain reconnaissance or map planning is necessary to prevent wire strikes.
- The goggles can be adjusted to compensate for individual sight differences but astigmatism cannot be corrected. Additionally, the goggles must be constantly adjusted when looking inside and outside the cockpit.
- Because the goggles adjust to the immediate light intensity, cockpit lights must be adjusted to a low intensity. Warning lights, caution panel lights, and proximity lights may tend to have a blinding effect, if illuminated, as the goggles adjust to light intensity.
- Standard maps are difficult to interpret using night vision goggles. Specialized maps are being tested.
- Pilot fatigue factors are increased with goggle use. The goggles may become uncomfortable after 2 hours use.
- Eyepieces of the goggles will fog over during use in cold climate conditions. De-mist shields, warming the goggles, or wiping the lenses can eliminate this problem.
- Battery life expectancy cannot be determined accurately. Batteries should be changed before each new mission. For all missions, a spare battery should be carried.
- The infrared illuminator trouble light is used for emergency extreme darkness conditions and for viewing within 2 meters. This light source can be detected by threat night vision viewing devices.
- Each set of night vision goggles may vary as to light amplification capability due to manufacturer's quality control tolerances.

IMPROVED LIGHTING SYSTEM FOR ARMY AIRCRAFT (ILSAA).

Research, development, and testing is currently underway to provide an improved lighting system modification package for existing and future Army aircraft. The testing and development program will

encompass crew station paint color/type, lighting methods/control, glare control, and placard/decal location/color in relation to accommodating day reduced visibility flight, night unaided eye flight, and night vision goggle flight.

Modification of current Army aircraft inventories will be controlled at the appropriate maintenance echelon. Unauthorized field modification fixes are discouraged until the ILSAA has been tested and proven safe and effective.

The feasibility of tactical instrument flight to accomplish the mission in the high threat environment will be dependent on threat air defense and electronic warfare (EW) capabilities, ceilings and visibility, available air traffic control aids, and on-board ASE/EW electronic counter-countermeasure support. Planning considerations are provided in chapter 8. FM 1-60, *Airspace Management and Army Air Traffic in a Combat Zone*, provides current doctrine, procedures, and techniques to be utilized by Army aircraft. FM 1-5, *Instrument Flying and Navigation for Army Aviators*, also provides techniques, methods, and planning considerations for tactical instrument flight.

**TACTICAL
INSTRUMENT
FLIGHT**

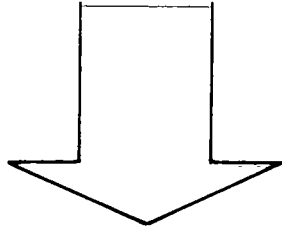
The tactical advantage of surprise can also be gained during daylight reduced visibility operations. As with night or tactical instrument missions, planning will be much more detailed. Planning considerations are provided in chapter 8. Flight techniques, with regard to airspeed, altitude, and loads, will be what visibility allows for flight safety. Threat visual detection will be degraded and allow increased effectiveness of such missions as air assaults, raids, and deployment of troops/equipment on the battlefield to gain a tactical advantage. The high-performance air threat will also be degraded increasing Army aircraft survivability.

**REDUCED
VISIBILITY
OPERATIONS
OTHER THAN
NIGHT
TACTICAL
INSTRUMENT
FLIGHT**

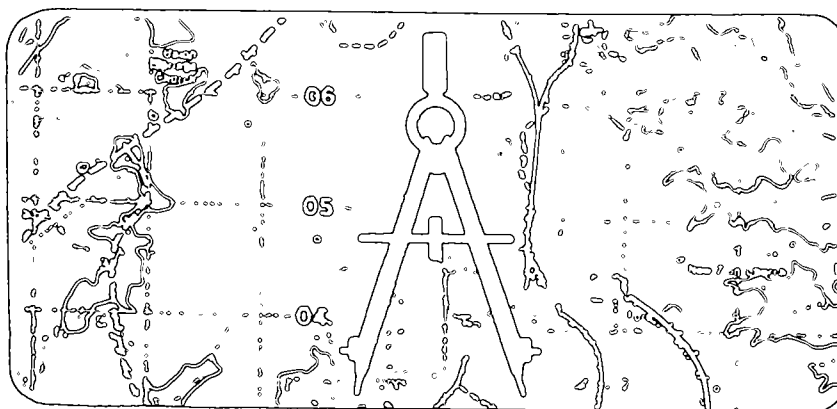
SUMMARY

Commanders must continue to stress Army aviation operations during periods of reduced visibility. Tactics will remain the same to survive the threat, but techniques must be adjusted to fit the situation. We know that the combat operational doctrine of threat forces stresses decisive offensive tactics in defeating an enemy force. We must be prepared to meet the threat on a 24-hour basis. With the advantage of superior reduced visibility aids, we can defeat a numerically superior force provided training proficiency complements reduced visibility operations.

CHAPTER EIGHT



PREMISSION PLANNING IN THE HIGH THREAT ENVIRONMENT



SURVIVAL IN THE HIGH THREAT ENVIRONMENT

Army aviation unit survival in the high threat environment will be dependent on how well the "Principles of Employment" have been implemented in conjunction with sound judgment and commonsense. The "Principles of Employment" were first introduced and discussed in detail in chapter 3, FM 90-1, *Employment of Army Aviation Units in a High Threat Environment*.

The successful use of the principles of employment on the battlefield will depend to a large degree on how well we have preplanned the mission. Each part of the combined arms team, in conjunction with the scheme of maneuver, must work in harmony at the right time and place if we are to defeat a numerically superior force.

THE PRINCIPLES OF EMPLOYMENT

- ☐ Fight integrated on the combined arms team.
- ☐ Exploit capabilities of other Services.
- ☐ Capitalize on intelligence-gathering capabilities.
- ☐ Suppress enemy weapons and acquisition means.
- ☐ Exploit firepower.
- ☐ Exploit mobility.
- ☐ Integrate fire and maneuver.
- ☐ Employ surprise.
- ☐ Mass forces.
- ☐ Utilize terrain for survivability.
- ☐ Displace forward elements frequently.
- ☐ Maintain flexibility.
- ☐ Exercise staying power.

In order to properly preplan the mission, let's first take into account the factors that will affect it. Each mission will be peculiar in that the unexpected element is a factor. But we can eliminate much of the "unexpected" through training, coordination, preplanning, and the use of standing operating procedures (SOP). Here is a list of things that most commonly affect your ability to accomplish the mission:

FACTORS AFFECTING MISSION ACCOMPLISHMENT

- 1 Training Proficiency**
- 2 Proper Employment of Aviation Assets**
- 3 Weather/Reduced Visibility**
- 4 Time**
- 5 Operational Plan**
- 6 Friendly Situation**
- 7 Enemy Situation**
- 8 Terrain**
- 9 Proper briefings**
- 10 Combined Arms Support**

The "unexpected" is also a factor!

① **TRAINING PROFICIENCY.** Training proficiency will determine how well you are able to use “The Principles of Employment” and onboard aircraft survivability equipment (ASE), and to work as a member of the combined arms team. Your knowledge of the threat (employment techniques, capabilities, limitations) will determine the success of your tactics, plus your ability to react and use the right mix of equipment at the right moment. Finally, your knowledge of coordinating agencies and procedures may get you out of a jam when you need fire support or go inadvertent instrument meteorological conditions (IMC).

② **PROPER EMPLOYMENT OF AVIATION ASSETS.** In order to properly employ aviation assets, the commander must be aware—or you as the staff member, aviation unit commander, or air mission commander must make him aware—of Army aviation capabilities and limitations.

FACTORS AFFECTING EMPLOYMENT OF AVIATION ASSETS

- ☐ **Mission Effectiveness**
- ☐ **Command Relationships/Tactical Support Mission**
- ☐ **Number/Type Aircraft Available**
- ☐ **Weather Capabilities/Limitations**
- ☐ **Aircraft Vulnerabilities**
- ☐ **ATC Requirements**
- ☐ **Logistical Requirements**
- ☐ **Allowable Cargo Loads**
- ☐ **Fuel Ordnance Mix**

☐ *Mission Effectiveness.* Mission effectiveness refers to employment of aviation assets in conjunction with type mission. For instance, the use of assault/attack helicopters in the attack of fortified/built-up areas is not mission effectiveness. On the other hand, the mission effectiveness of

**ARMY AVIATION UNITS
CAN PERFORM ALL
FUNCTIONS OF LAND
COMBAT**

the air cavalry troop of the divisional cavalry squadron is optimized in the reconnaissance, intelligence-gathering, and security roles. Therefore, the mission will determine the type aviation assets that can best be used, and in what configuration, or if aviation assets should be used at all. In general, though, Army aviation units offer an extreme degree of mobility and flexibility to the commander as they can perform all of the five functions of land combat:

- FIREPOWER
- MOBILITY
- INTELLIGENCE
- COMMAND AND CONTROL
- COMBAT SERVICE SUPPORT

● *Command Relationships/Tactical Mission.* The command relationship/tactical mission should be determined by the type, size, and friendly situation of the gaining unit. Air cavalry and attack helicopter units may be attached, but most often will be placed under operational control (OPCON) to brigade-level units due to the logistical burden created by these maneuver units. In either relationship, these units are fully integrated into the overall tactical scheme of maneuver.

The normal relationship of assault helicopters and other aviation support units will be the OPCON to the gaining unit and assignment of tactical support missions of direct support with coordination when employed at maneuver battalion/company level, in order to maintain control, flexibility, and optimum effectiveness.

● *Number/Type Aircraft Available.* The number and type aircraft available may affect our ability to accomplish the mission or, at least, how we will go about accomplishing the mission. If an aviation unit is assigned many tasks in support of another unit, priorities may have to be established or additional aviation support requested by the commander.

● *Weather Capabilities/Limitations.* The commander must be aware of the effects of wind, temperature, humidity, icing,

precipitation, ceilings, and visibility of Army aviation operations. However, even under adverse conditions, Army aviation is constantly striving to increase staying power and to develop round-the-clock operating procedures.

**ARMY AVIATION IS
CONSTANTLY STRIVING
TO INCREASE STAYING
POWER**

Through the system of air traffic control (ATC) and navigational aids (NAVAID), tactical instrument flight capabilities can be extended from the corps/division rear area (flight operations center (FOC), Flight Coordination Centers (FCC)) to the frontline elements (ATC platoons, tactical teams). However, the threat and aviation element mission size will determine the practicability of tactical instrument flight.

In the high threat environment, the air defense/electronic warfare threat may negate tactical instrument flight, and especially near frontline units. For multiple-aircraft missions, time and separation requirements may negate mission effectiveness. In addition, the use of attack helicopters in the armor-killing role may not be mission effective if the visibility is so low that their standoff capability cannot be used.

However, the positive approach toward mission accomplishment should be emphasized. The total battlefield weather picture should be considered. A combination of tactical instrument flight and altitude adjustment to visual flight rules (VFR) terrain flight modes nearer frontline elements—weather permitting—may be able to get the job done.

○ *Aircraft Vulnerabilities.* Aircraft vulnerabilities must be considered by the commander to maximize Army aviation effectiveness. The type and amount of ASE equipment onboard the aircraft may determine the effectiveness of mission accomplishment. The size and shape of pickup zones (PZ)/landing zones (LZ) must be considered in relation to the size/number of aircraft. Terrain must be considered in relation to vegetation, altitude, and temperature. Aircraft should be employed at standoff distances or in conjunction with suppression against enemy ground units as they are soft targets.

● *Air Traffic Control Requirements.* ATC requirements, in conjunction with the type mission, should be a consideration of the commander. Such things as flight corridors, coordinating altitudes, standard-use Army aircraft routes, minimum risk routes, airfield terminal control procedures, identification, friend or foe (radar) (IFF) codes, and available navigational aids should be coordinated with higher headquarters and disseminated to aviation elements.

In certain instances, pathfinders and tactical teams (tac teams) may aid in the orderly conduct of the mission. Flight Coordination Centers can aid in mission control through radar vectors or flight-following. FCCs can also act as information/coordinating agencies in passing advisories/reports to higher headquarters or in disseminating advisories on hostile air traffic in the area. Air rescue assistance coordination may also be effected through the FCC.

● *Logistical Requirements.* Logistical requirements for Army aviation unit operations must be thoroughly coordinated by the commander to aid in rapid turn-around times, on-the-spot maintenance, and aircraft recovery.

● *Allowable Cargo Loads.* The type aircraft, area of operations, and climate will affect allowable cargo loads. The commander must be made aware of aircraft capabilities/limitations in this regard in order to assure a smooth, coordinated mission/operation.

● *Fuel/Ordnance Mix.* The same factors affecting allowable cargo loads can also affect the fuel/ordnance mix and capabilities of attack helicopters. In addition, the commander must be made aware of the fuel/time/ordnance tradeoff to insure proper mission effectiveness.

**WEATHER AND REDUCED
VISIBILITY DO NOT
HAMPER RADAR GUIDED
WEAPONS**

3 WEATHER/REDUCED VISIBILITY. Weather and reduced visibility can be a help or a hindrance to Army aviation operations. The optimum advantage to conduct of any combat operation during periods of weather/reduced visibility is gaining the element of surprise. In addition, weather/reduced visibility may be a hindrance to threat

high-performance aircraft operations, visual acquisition weapons systems, and infrared homing missiles. However, it must be noted that *weather/reduced visibility is not a hindrance to radar-guided weaponry.*

There are four basic types of missions in the weather/reduced visibility category: Weather (actual tactical instrument flight), night/reduced visibility (due to smoke, haze, fog, rain, or snow), night tactical operations, or a combination (night weather).

○ *Weather.* Assuming the threat (enemy situation) has been considered the flight route has been planned accordingly, and basic flight safety requirements (weight/balance, fuel, wind, power, icing) can be met, let's isolate peculiar planning requirements for a tactical instrument flight. The following is a way to plan the flight:

▲ If weather service is available, check the current and forecasted weather conditions for takeoff, en route, and destination. If weather service is not available, use radio reports from various unit locations along the planned route. Ceiling/visibility requirements will be subjective according to the urgency of the mission, the threat, availability/capability of navigational aids, type/number of aircraft, and pilot proficiency. In most cases, for helicopters, tactical instrument flight should not be necessary. If ceiling/visibility conditions are so bad as to preclude nap-of-the-earth (NOE) flight, tactical instrument flight would not be a consideration. However, for our purposes, let's say ceiling/visibility currently at our location is zero/zero but is 200¼ at our destination is forecasted to be acceptable at our location for the return flight.

**USE RADIO REPORTS
FROM UNITS ALONG THE
ROUTE IF WEATHER
SERVICE IS NOT
AVAILABLE**

▲ Check available ATC facilities, frequencies, and terminal control procedures. ATC platoons operating forward airfields have the capability of nondirectional radio beacon (NDB) and ground controlled approaches (GCA). The FCC may be helpful in providing enroute flight-following and advisories depending on altitude/distance factors. The useful signal of tactical NDB for navigational purposes will also be dependent on altitude/distance.

For planning purposes, the following information should be considered.

AN/TRN-30(V) TACTICAL NDB		
POWER MODE	RANGE (KM)	ALTITUDE (ABOVE HIGHEST OBSTACLE, FEET)
Pathfinder (low)	15 km - 25 km	200 feet to 500 feet
	25 km - 40 km	Above 500 feet
Tactical (med)	85 km	Above 500 feet
Semi-fixed (high)	180 km	Above 500 feet

For divisional airfields, the power mode will probably be no more than tactical, and usually pathfinder, to prevent enemy detection/jamming. In addition, forward airfields may only activate NDBs on request.

Tactical teams (tac teams, 3 each) are assigned to the division aviation battalion for the purpose of extending the control and coordination of Army air traffic in forward battle areas. They provide advisory services and air traffic assistance at brigade/battalion command posts (CP), heliports, resupply points, or temporary landing areas. Upon request, through operations or maneuver unit S3 operations, they can be located in forward areas to provide navigational assistance (advisories/NDB) for your mission. Check out your operations or supported unit S3 for tac team locations and frequencies, or request they be positioned to support your mission.

The tac team also carries the man-pack version of the AN/TRN-30(V) NDB. It should be positioned to mask radiating signals toward the threat and maximize usable signals toward your flightpath. In forward areas, the normal power output for the NDB will be in the pathfinder mode and you normally will be below 500 feet above ground level (AGL). To prevent enemy detection, the NDB may be available only on request. Check the frequencies of nearby Hawk (ADA) units. When all other navigation means have failed, they may be able to provide radar vectors.

▲ Prepare your tactical map with time, distance, and heading information as a backup to navigational aids; or use it as your primary navigational source with NAVAIDs (as requested) for backup. This will also deter enemy jamming/meaconing. As a last resort, if NAVAIDs fail, plan frequency-modulated (FM) homing techniques as another backup measure.

▲ Study your tactical map with time, distance, and heading information in relation to terrain relief/elevations and manmade obstacles. From this, determine your enroute altitudes. If possible, plan to decrease your altitude as you proceed closer to frontlines. Terrain relief permitting, you may plan to descend at some point en route and break out VFR, then proceed NOE from that point. However, this procedure may require extreme familiarity with the area to obtain your bearings once VFR.

▲ Plan your takeoff/approach according to terrain relief/elevation and wind factors. The airfield ATC/tac team will also be able to advise on approach path.

▲ File your instrument flight rules (IFR) flight plan locally or in the air with FCC/FOC.

○ *Night/Reduced Visibility.* Planning considerations for night/reduced visibility, Army aviation operations can be just as demanding as those for tactical instrument flight depending on ambient light level and visibility restrictions. For night operations, the effects of fog, haze, smoke, and overcast sky conditions will limit the pilot's visibility capabilities even with the aid of night vision goggles. As with weather operations, the decision to accept a mission is again subjective.

**AS WITH WEATHER
OPERATIONS, THE
DECISION TO ACCEPT A
MISSION IS SUBJECTIVE**

For our purposes, we will again assume that the threat has been considered; the flight route has been considered; the flight route has been planned accordingly; visibility requirements can be met; and basic flight safety requirements can be met. We can now isolate peculiar flight planning requirements.

NOTE

For night operations, a detailed discussion is presented in TC 1-28, Rotary Wing Night Flight, and the "Preparation for Night Flight" series, TC 1-29 through TC 1-32, discuss preparation of the aircraft.

▲ Prepare your tactical map with distance and heading tick marks/information. For night flight, insure clean, uncluttered lines and information, using colors that can be seen at night with a red lens. Select air control points and use barrier landmarks on your map as backup orientation checks. During night/reduced visibility operations, visibility restrictions may not allow use of prominent terrain features; and other terrain features may appear different.

▲ Conduct a thorough map reconnaissance of your flightpaths and mark terrain manmade obstacles.

▲ Check unit locations at flight operations or maneuver unit S3 and note call signs/frequencies. You may need them for backup FM homing navigation.

▲ Check frequencies/navigational aids of ATC facilities in the area of operations for use in case of inadvertent entry into instrument flight conditions.

▲ Plan for positive identification procedures of destination landing zones/facilities.

**ALL ELEMENTS OF
THE COMBINED
ARMS TEAM MUST
FUNCTION AT THE
RIGHT TIME AND
PLACE**

4 TIME. Each mission must be evaluated in relation to time. At NOE altitudes, fuel and power requirements to cover distances will be greater. If time requirements cannot be met in relation to fuel, logistical support must be positioned to accomplish the mission. If threat or weather conditions dictate time separation requirements for multi-helicopter operations, can we mass enough troops/materiel at the right time to be effective? Can we get fire support at the right time to support the mission? As previously stated, in order to win while outnumbered, all elements of the combined arms team must function smoothly at the right time and place.

5 OPERATIONAL PLAN. It would be nice if each operational plan were developed with optimum effective utilization of Army aviation assets. Unfortunately, this will not be the case in all situations. Therefore, we must be able to tailor aviation assets to fit the operational plan or advise the commander on how or if aviation assets can be utilized for a given operation.

6 FRIENDLY SITUATION. The current friendly situation can be obtained from your unit operations, the division G3, or the supported maneuver unit commander/S3. When supporting a maneuver unit, the friendly situation will be briefed/coordinates by the maneuver unit commander or S3 with the air mission commander. In order to preplan the aviation mission in relation to the friendly situation, you must simply ask yourself "who, where, when, what, and how?"

BASICS OF THE FRIENDLY SITUATION

WHERE?

Where are the units located?

WHEN?

When are these units supposed to react, and how in conjunction with the scheme of maneuver or operational plan?

WHO?

Who are the units involved, their call signs, and frequencies (infantry, armor, artillery, air defense artillery (ADA), tac air, higher headquarters, ATC, etc.)?

WHAT?

What is the scheme of maneuver or operational plan? What are the supported/supporting unit capabilities?

HOW?

How do we fit into the mission?

7 ENEMY SITUATION. The threat or enemy situation is one of the more important considerations in premission planning. The threat will determine how you will go about accomplishing the mission and the required support you will need. The enemy situation can also be briefed/coordinated at your unit operations, at the division G2/G3, or by the supported maneuver unit commander S3/S2.

The following should be known in relation to the threat:

BASICS OF THE ENEMY SITUATION

A

Enemy tactical posture (defensive, offensive, etc.).

B

Enemy strength, size, type units, and locations.

C

Known/suspected and type enemy air defense weapons locations.

D

The current electronic warfare (EW) capability and posture.

E

The current tac air capability and posture.

F

The current enemy nuclear, biological, chemical (NBC) capability and posture.

With this, you can plan your maneuver, command and control, communications procedures, needed equipment and armament, and how and when to use the equipment.

⑧ **TERRAIN.** A good terrain analysis is inherently necessary for a smooth, coordinated, and successful mission. If time permits, a reconnaissance of the mission area should be flown to determine the best primary and alternate flight routes, hazards, flight travel techniques, checkpoints, start points, release points, control points, landing/pickup zones, and firing locations. If time does not permit, a thorough map reconnaissance should be made. FM 1-1, *Terrain Flying*, provides detailed guidance on premission planning with regard to terrain.

**IF THERE IS NO TIME
TO SCOUT THE AREA,
STUDY YOUR MAP
THOROUGHLY**

⑨ **PROPER BRIEFINGS.** A thorough mission briefing is necessary by the unit commander/air mission commander, after coordination with unit operations or the supported unit commander, with unit aviation personnel to insure a smooth, coordinated, and successful mission. A thorough briefing should include:

○ *Situation*

▲ Enemy forces: Terrain identification, locations, activity, and strength.

▲ Friendly forces: Requirements of next higher unit. Locations and planned actions of adjacent units. Locations and planned actions of supported unit. Fire support available. Missions, routes, and altitudes of other aircraft. Attachments and detachments.

▲ Weather forecast: Weather forecast for duration of mission.

○ *Mission*

○ *Execution*

▲ Plan of operation.

▲ Specific duties of subordinate elements.

• Flight plan, routes, method of travel, formations, start point, ACPs, CPs, RPs, LZs, PZs, firing points, and location.

• Loading plan

• Landing plan

▲ Locations of friendly airfields/heliports.

▲ Coordinating instructions.

- Air traffic control.
- Artillery support—locations, reference lines, preplanned fires, registrations, concentrations, and barrages.
- Tac air support—coordinating procedures, preplanned fires, and concentrations.
- Air defense artillery support—locations, coordinating procedures, and preplanned fires.
- Ground units at objective, methods of contact, and recognition.
- Other (as appropriate for specific missions) ASE use; EW support.

▲ Pickup point for downed crews and passengers.

▲ Reporting procedures.

● *Administrative and logistics.*

▲ POL/ammunition requirements, location, and procedures.

▲ Maintenance and aircraft recovery.

▲ Special equipment.

▲ Medical evacuation.

▲ Rations.

▲ Relief.

● *Command and Signal.*

▲ Command.

- Command and control procedures.
- Chain of command and location of command.

▲ Signal.

- Air-to-air, air-to-ground signals.
- CEOI—frequencies, call signs.
- Codes—IFF modes/codes, authentication, map, and operational.

10 **COMBINED ARMS SUPPORT.** The support required for optimum mission accomplishment may not always be available. The available tactical support may affect the method of maneuver during the mission, communications procedures, command and control procedures, organic ordnance loading and reconnaissance capabilities and methods. Permission planning in relation to combined arms support involves knowing what support can best be used in conjunction with the mission, and where the support is located or can best be located.

1

For air assault operations, combined arms support will be distributed by the operational plan from corps and division. The air mission commander, in this case, should be briefed by the task force commander or his S3 on—

- What support is available.
- Where the support is located.
- Call signs, frequencies, and codes/modes.
- How and when the support will be worked into the scheme of maneuver.

Based on the friendly/enemy situations, the scheme of maneuver, and the planned support, the air mission commander should then advise the task force commander on—

- How aviation elements can best be worked into the scheme of maneuver.
- Additional support needed to complement the mission and recommended locations.

2

For reconnaissance, combat service support, or general support missions, premission planning for the air mission commander or individual aviator—in relation to combined arms support—involves coordination with unit operations on—

- Various support unit locations.
- Call signs, frequencies, and codes.
- Support requests with regard to the mission based on the friendly/enemy situation, the flight route, and meteorological conditions.

Combined arms support for Army aviation purposes can be classified into four categories:

- 1 **Airspace management/control.**
- 2 **Fire support.**
- 3 **Electronic warfare support.**
- 4 **Logistical support.**

1 **Airspace management/control.**

Airspace Management and Coordinating Agencies. Army airspace management begins at corps level. Responsibility for airspace management functions rests with the commanders from corps level through battalion level. Each commander should be knowledgeable of airspace and airspace control requirements and should incorporate them into all operational planning. The commander, in conjunction with his staff, should be able to arrange for and be knowledgeable of all ATC support, fire support, and the interface between the two for coordinated use of airspace in conjunction with combat operations.

The corps division tactical operations center (TOC) has within its organic and attached personnel the necessary elements for planning, coordinating, and managing airspace in conjunction with fire support (ADA, artillery, tac air) for combined arms interface and combat operations. Members of the team include the corps/division air defense officer, aviation officer, fire support coordinator, and G2/G3 staff members.

Members of this team are organized by the commander into what is commonly referred to as the "airspace management element" (AME). The Air Force provides interface at the corps/division level by collocating the direct air support center (DASC) with the tactical operations center.

The purpose of the DASC is to provide a fast reaction capability to satisfy immediate requests from Army forces for tactical air support.

**THE TACTICAL AIR
COMMAND HAS FINAL
AUTHORITY FOR ALL
AIRSPACE UTILIZATION**

For our purposes then, the TOC is the ultimate approval/disseminating agency for all actions involving the joint use of airspace, fire support, and inherent rules of airspace utilization in conjunction with combined arms operations. Through subordinate commands (brigade, battalion, and company) and air traffic control agencies, the TOC coordinates, plans, and disseminates —

- Flight corridors.
- Coordinating altitudes.
- Minimum risk routes.
- Standard-use Army aircraft routes.
- Airfield terminal control procedures.
- Identification, friend or foe (radar) (IFF) codes.
- Fire control procedures (artillery, air defense).
- Electronic warfare control procedures.
- Pathfinder/tac team operations.
- Tactical air support operations.

Subordinate air traffic management agencies are manned by assets from the air traffic control battalion (corps). These agencies include a system of manual flight operations centers, flight coordination centers, approach/departure control facilities, airfield control towers, and navigational aids provided throughout the corps area for the control and coordination of Army air traffic.

**SUBORDINATE
AIR TRAFFIC CONTROL IS
PROVIDED AT CORPS
LEVEL**

The FOC is a corps-level, enroute air traffic control facility for Army air traffic in the rear operations area. In its area of operations, the FOC provides —

- Defensive/offensive mission control.
- Navigational/flight-following assistance.
- Air rescue assistance.
- Hostile aircraft warning to friendly aircraft.
- Communications link with the tactical air control system, (TACS) Air Defense Command Posts (ADCP) and subordinate FCCs.

**THERE WILL USUALLY
BE AN FCC IN EACH
CORPS AND DIVISION
AREA**

The FCC in corps and divisional areas is an extension of communications for the corps FOC and insures continuity of the flow of information required for air defense (ADA, tac air) and air traffic management operations. An FCC normally will be located in each corps and division area and is manned/operated by corps assets from the air traffic control battalion.

The FCC provides—

- Enroute navigational/flight-following assistance.
- Defensive/offensive mission control.
- Air rescue assistance.
- Hostile aircraft warning to friendly aircraft.
- Communications link with division airfields, other tactical airfields/heliports, the division TOC, adjacent FCCs, and the corps FOC.

The air traffic control company (forward) is an element of the ATC battalion (corps) which is normally employed with its platoons placed in direct support of corps and division aviation units operating airfields/heliports requiring ATC services. The ATC platoon leader acts as a liaison officer with the airspace management element of the TOC. The airfield/heliport ATC platoon provides—

- Terminal and enroute flight-following.
- Navigational aids (NDB/GCA).
- Air warnings.
- General airspace management/coordination.

To further extend the control and coordination of Army air traffic management in the forward divisional area, three tac teams are assigned to the division aviation battalion. An additional tac team is found in the ATC platoon operating the unit airfield/heliport—usually division.

These teams can be allocated on a permanent basis to each of the maneuver brigades or on an as-needed basis by the division commander. They provide advisory services and air traffic assistance at heliports, temporary landing areas, resupply points, command posts, and other locations, as requested. Each four-man tac team has the AN/TRN - 30 (V) nondirectional beacon and AN/TSQ-97 control facility—both man-portable. They can be requested to provide air traffic control/navigational assistance during forward area operations.

**TAC TEAMS PROVIDE
ADVISORY SERVICE AND
AIR TRAFFIC ASSISTANCE**

Army pathfinder units provide navigational assistance and aircraft control services, as necessary, during any phase of an operation that requires sustained employment of Army aircraft. Pathfinders normally are used to select, improve, mark, and control landing/pickup/drop zones.

Premission planning with regard to air traffic control is a matter of—

- Knowing established airspace controls.
- Knowing locations, frequencies, and call signs of available ATC support.
- Requesting available ATC support.
- Checking terminal control procedures for available navigational aids.



Fire support.

Outside agencies that can provide preplanned and immediate fire suppression include:

- Artillery/mortars
- Air defense artillery
- Tactical air

● ARTILLERY

DIVISION	CORPS
Divisional artillery (DIVARTY) is organic to a division and, usually, one subordinate battalion is assigned the tactical mission of direct support to a maneuver brigade. Units not in direct support may be assigned tactical missions of reinforcing, general support reinforcing, or general support.	Nondivisional (group) artillery is assigned at corps level and usually is allocated to division commanders as additional artillery support on an as-needed basis, or augments divisional artillery fires as directed by the corps commander.

Supporting artillery unit personnel are provided to each command level to advise, plan, and coordinate supporting artillery fires for the maneuver unit commanders in conjunction with combined arms operations. The individual artillery unit headquarters, in conjunction with artillery unit fire direction centers and forward observers, controls supporting artillery fires.

COORDINATING AGENCIES FOR ARTILLERY FIRE SUPPORT

UNIT LEVEL SUPPORTED	COORDINATING AGENCY
CORPS	Fire Support Element (FSE) Provided and operates in the corps tactical operations center (CTOC)
DIVISION	Fire Support Element Provided and operates in the division tactical operations center (DTOC)
MANEUVER BATTALION	Fire Support Element Provided and operates in the battalion operations center (S3)
MANEUVER COMPANY	Fire Support Team (FIST) Company/Team Commander, Weapons Platoon Leader (81mm mortars), Heavy Mortar Platoon Observer (4.2-inch mortars), and Field Artillery Observer (FO). Operate as necessary on battlefield.

Planned artillery fires and targets are developed by each coordinating level in relation to the operational plan/scheme of maneuver. These preplanned targets are then distributed throughout the system, higher and lower, to appropriate coordinating agencies and to the appropriate artillery unit headquarters/fire direction centers (FDC).

Premission planning in relation to combined arms operations or aviation unit operations then involves—

PREMISSION PLANNING

○ Air mission commander/maneuver unit commander/S3 coordination briefing on planned targets, targets/numbers, and call signs/frequencies for requesting them.

○ Noting artillery unit, FDC and FIST locations, call signs, and frequencies.

○ Requesting preplanned artillery fires through unit operations channels to support aviation unit missions.

Calls for *preplanned artillery/mortar fires* include—

PREPLANNED ARTILLERY/ MORTAR FIRES

○ Identification of requestor:

**Y5F47, this is D3L39.*

○ Warning order:

Y5F47, this is D3L39; immediate suppression/suppress.

○ Target identification:

Y5F47, this is D3L39; suppress, checkpoint 10 or 400 meters south of checkpoint 10.

○ Target description:

Y5F47, this is D3L39; suppress, checkpoint 10, enemy antiaircraft emplacement.

○ ****Method of engagement:**

Y5F47, this is D3L39; suppress, checkpoint 10, enemy antiaircraft emplacement, smoke and variable time (VT) fuze.

○ ****Method of fire and control:**

*Y5F47, this is D3L39; suppress, checkpoint 10, enemy antiaircraft emplacement, smoke and VT, (*at my command) fire-for-effect.*

*After establishment of initial communication, full call signs are no longer required.

**Not necessary in call-for-fire. Optional at requestor's discretion.

The request for fire can go to—

- Artillery unit FDC (fastest means).
- Maneuver unit FSE or FIST.

There may be times when artillery or mortar fire support is needed that has not been preplanned. If a trained forward observer is not available, you will have to be able to initiate the request for fire and adjust it onto the target. If artillery fire is needed on an individual basis, don't be surprised if the artillery unit is unable to fire your mission. Priority of artillery fires is allocated to the supported unit, reinforced unit, own observers or force artillery headquarters according to the command relationship and tactical mission.

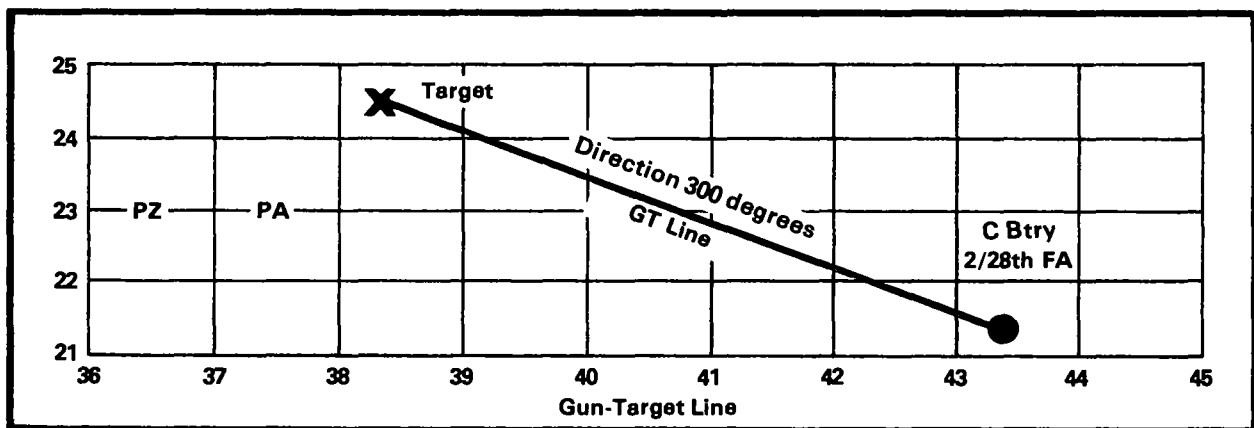
NOTE

Be prepared to authenticate on all requests for artillery/mortar fire support using your Communications-Electronics Operation Instructions (CEOI).

IMMEDIATE FIRES Artillery fires that are not preplanned are called *immediate fire requests*. Permission planning in regard to immediate artillery suppression involves:

- Coordination with unit operations, higher headquarters FSE, or supported maneuver unit commander/S3 with regard to artillery/mortar locations and FDC/FSE/FO call signs and frequencies.
- Knowing weapons and munitions capabilities.
- Knowing how to call for and adjust artillery fires.

Coordination of artillery/mortar locations, call signs, and frequencies is self-explanatory.



Accurate location of the artillery/mortar weapons locations on your tactical map is important as you may have to adjust the impact of the rounds from the gun/target line of fire—a real or imaginary directional line from the guns to the target.

☐ **ARTILLERY/MORTAR WEAPONS AND MUNITIONS CAPABILITIES.** In order to plan for artillery coverage and to avoid flying into artillery coverage areas you must know artillery unit locations, the type unit, and range capabilities.

TABLE 8 ARTILLERY/MORTAR WEAPONS AND MUNITIONS CAPABILITIES			
WEAPON	MAXIMUM RANGE	SHELL TYPES	FUZE TYPES
Mortar, 81mm	4,737 meters	HE, WP, Illum	PD
Mortar, 4.2-inch	5,650 meters	HE, WP, Illum	PD
M101A1, 105mm	11,000 meters	HE, WP, Illum, HC, ICM	PD, Delay, Time
M102, 105mm	11,500 meters	HE, WP, Illum, HC, ICM	PD, Delay, Time
M114A1, 155mm, towed	14,600 meters	HE, WP, Illum, HC, Cml, ICM	PD, Delay, Time, VT
M103, 155mm, SP	14,600 meters	HE, WP, Illum, HC, Cml, ICM	PD, Delay, Time, VT
M109A1, 155mm, SP	18,100 meters	HE, WP, Illum, HC, Cml, ICM	PD, Delay, Time, VT
M110, 8-inch, SP	16,800 meters	HE, WP, Cml, ICM, CP	PD, Delay, Time
M110E2, 8-inch, SP	20,700 meters	HE, WP, Cml, ICM, CP	PD, Delay, Time
M107, 175mm, SP	32,700 meters	HE, WP	PD
CP - concrete-piercing HC - smoke ICM - Improved conventional munitions HE - high explosive PD - point detonating VT - variable time WP - white phosphorous			

In an *immediate* suppression situation, it will be helpful to know which type shell and fuze combinations will be most effective against which type targets. The shell/fuze action desired *may be* included in the call-for-fire. If type shell/fuze combination is not specified in your call-for-fire, you will usually get shell HE and fuze PD or the coordinating agency fire direction officer (FDO) may determine the best shell/fuze action from your target description.

TABLE 9	TYPE SHELL AND FUZE COMBINATIONS EFFECTED AGAINST TYPE TARGETS
SHELL/FUZE	EFFECTIVE AGAINST
HE/PD	Hard targets (tanks), infantry, mechanized vehicles
HE/Delay	Bunkers, dug-in targets, targets in tree line
HE/VT	Infantry, artillery, air defense weapons, light armor-piercing capped (APC)
HE/Time	Infantry, artillery, air defense light armor (APC)
ICM/PD	Infantry, towed artillery, and air defense weapons (open targets)
WP/PD	Incendiary/smoke screening action; open targets, POL/ammunition dumps; good against all targets for screening action.
HC/PD	Good as a screen to deny visual acquisition.

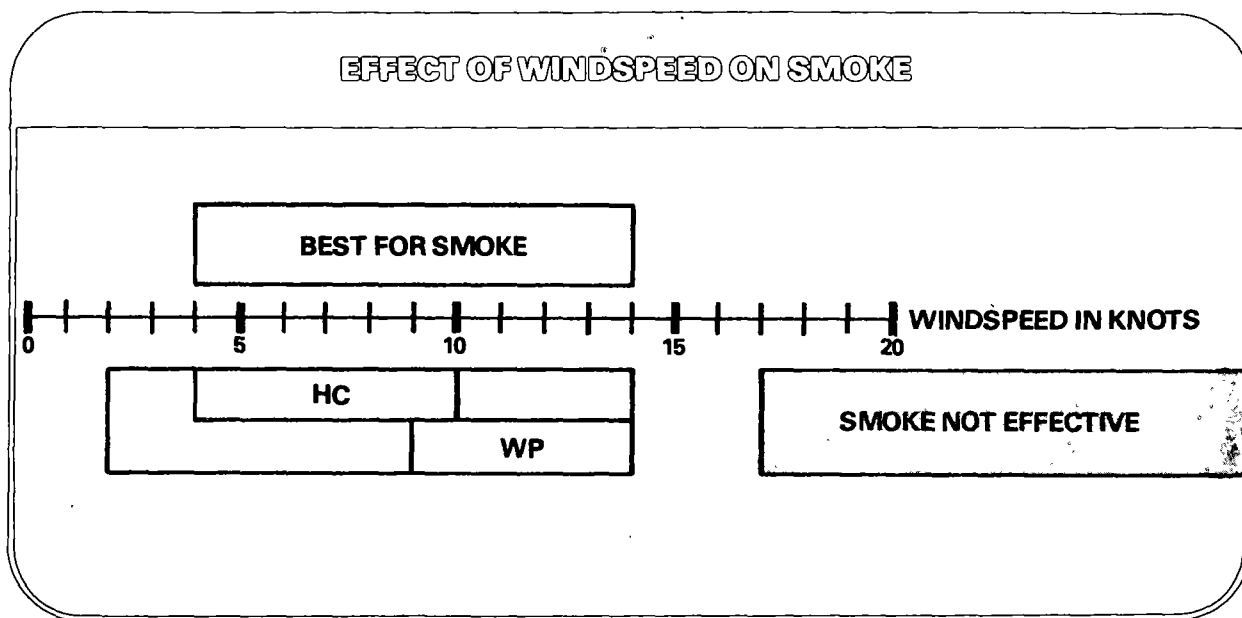
NOTE

If type shell is unspecified in your call-for-fire, you will receive HE. If type fuze is unspecified in your call-for-fire, you will receive PD.

□ **CONSIDERATIONS FOR USE
OF WP AND HC SMOKE.**

The use of smoke can be highly effective as a means to deny enemy visual observation/acquisition of combat operations and maneuvers. However, smoke is affected by wind conditions and one must know how to employ smoke effectively. Smoke requires careful planning and control to allow for unfavorable conditions and to avoid interference with friendly operations. Adjustment of smoke rounds in relation to the target should be according to windspeed and direction. The rounds must be placed so the smoke will drift across the area you wish to obscure.

Windspeeds ranging from 4 knots to 14 knots are best for the production of smoke screens.



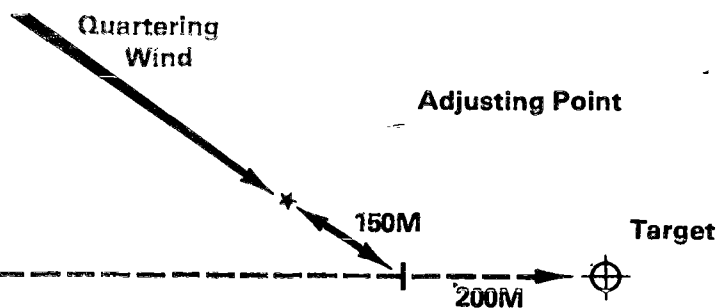
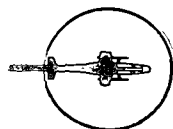
TEMPERATURE: A rise in temperature causes smoke to dissipate more rapidly.

HUMIDITY AND PRECIPITATION: Enhances effectiveness of smoke.

EFFECT OF WIND DIRECTION ON SMOKE

DELIVERY TECHNIQUE		WIND DIRECTION				Target area that can be obscured - 150 meters
		Cross	Quartering	Head	Tail	
Quick (Small Area Suppression)	WP	200S-150UW	200S-75UW	100S	200S	Adjusting point with respect to area to be obscured
	HC	200S-200UW	200S-150UW	100S	400S	
S-Short		UW-Upwind		Data In Meters; Area - 150 Meters		

ADJUSTMENT OF SMOKE WITH QUARTERING WIND USING 155MM HC



SMOKE COVERAGE AND DURATION

SMOKE COVERAGE				AVERAGE COVERAGE IN LENGTH (METERS)		
Delivery System	Type Round	Time To Build Effective Smoke	Average Burn Time	Wind Direction		
				Cross	Quartering	Head/Tail
81mm Mortar	WP	½ Min	1 Min	200	80	40
4.2 Inch Mortar	WP	½ Min	1 Min	100	60	40
105mm	WP	½ Min	1½ Min	75	60	50
	HC	1½ Min	3 Min	250	175	50
155mm	WP	½ Min	1½ Min	100	75	50
	HC	1½ Min	4 Min	350	250	75

☐ THE CALL-FOR-FIRE.

In order to achieve surprise and maximum effect on a target, consideration should be given to requesting a fire-for-effect (FFE) on the initial request for fire. This should be done only if you can accurately locate the target on your map within 100 meters. We will only be concerned with a sample call-for-fire, using coordinates as a target location method and entering the fire-for-effect phase on initial rounds. For detailed artillery observer techniques, consult TC 6-40-6, *Field Artillery Aerial Observer Team Operations*. In this case, our call-for-fire will include:

☐ Identification of observer and warning order:

D3H46, this is L4M36; fire mission; over.

☐ Target Location six-place coordinates:

Grid 426839, over.

☐ Description of target:

SA-9 battery in the open.

☐ Method of engagement:

*Fuze VT.

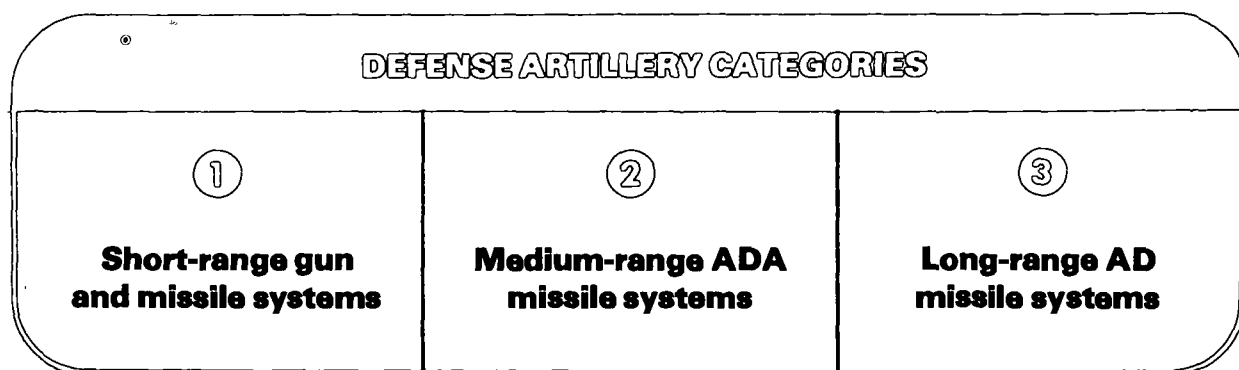
☐ Method of fire and control:

FFE, over.

NOTE:

*In this case, we are asking for a shell/fuze combination of HE/VT.

US air defense artillery assets are classified into three categories based on weapon range and altitude capabilities.



SHORT-RANGE GUN AND MISSILE SYSTEMS

Short-range gun and missile systems include the Vulcan 20mm gun, the Chaparral infrared missile, and the Redeye infrared heat-seeking missile. Ranges are 1,200, 5,000, and 3,000 meters, respectively. These systems are designed to provide air defense protection against hostile aircraft operating in low-altitude, flight regimes. The self-propelled Chaparral/Vulcan battalion is organic to infantry, armor, and mechanized infantry divisions. It has two Chaparral and two Vulcan batteries for a total of 48 gun and missile squads. The towed Vulcan battalion is organic to airborne and air assault divisions. It has four batteries of 12 towed Vulcans each. Nondivisional Chaparrals/Vulcans have the same number of guns and missiles as divisional battalions, but their Vulcans are towed.

■ The Redeye section is organic to maneuver battalions/squadrons and field artillery battalions. Each Redeye section consists of a headquarters element and three to six Redeye teams. The teams are usually allocated on the basis of one team per company/troop/battery size unit.

MEDIUM-RANGE ADA MISSILE SYSTEMS

The medium-range, ADA missile system is the Hawk radar-guided missile. Range of the missile is 40,000 meters. This missile system provides area air defense coverage of the low to medium hostile air threat. Redeye missile teams are organic to Hawk battalions to provide an increased self-defense capability.

■ Hawk battalions allocated for the protection of assets in the corps rear normally will be assigned general support missions. Hawk battalions allocated for air defense in the forward area normally are assigned tactical missions in direct support of committed divisions.

LONG-RANGE AD MISSILE SYSTEMS

The long-range, AD missile system is the Nike-Hercules radar-guided missile battalion. Range of the missile is 140,000 meters. Nike-Hercules provides theater air defense coverage against the high to medium hostile air threat.

COORDINATING AGENCIES

Divisional ADA assets provide liaison personnel to the supported unit commander to help plan, coordinate, and effect air defense coverage to suit the tactical situation. At corps level, the commander of the ADA group is the principal adviser to the corps commander on ADA matters. The group commander may use the chief of the air defense element as his

representative at the corps tactical command post. The group's air defense element joins with the corps aviation element to form the corps airspace management element (CAME). In addition to its airspace management duties, it provides an ADA planning/advisory service to the corps commander/G3.

Within a division, personnel from the Chaparral/Vulcan battalion command post join with Army aviation personnel to form the division airspace management element (DAME) which is an integral part of the division main command post. An ADA element is also positioned with, and forms a part of, the division tactical command post. In addition, a direct support (DS) mission requires the Hawk battalion to establish liaison and communications with the supported division. Accordingly, it sends a liaison officer to the division main post to work closely with the Chaparral/Vulcan and aviation personnel in the DAME. As an aid to airspace management, the division may also collocate an element from the aviation battalion/company flight coordination center with the Hawk battalion operation center (BOC).

**A HAWK BATTALION
LIAISON OFFICER
WORKS WITH DIVISION
AIRSPACE PERSONNEL**

The BOC's communication tie-in with Air Force control and reporting center/control and reporting post (CRC/CRP) and Hawk battalion's organic radars can provide valuable advisory/assistance data to Army flight leaders. This arrangement facilitates the exchange of radar, Air Force, and Army aviation information. Air defense remains the Hawk's first priority mission, but, when asked or in an emergency, the Hawk-associated FCC element can:

- Provide aircraft position-fixing and directional assistance service.
- Assist in IFF transponder checkouts.
- Help aircraft avoid known hazard areas.
- Distribute aircraft location and identification data to requesters.

The division and aircraft will also be warned by ADA of observed hostile air incursions. Conversely, aviation units operating forward of the forward edge of the battle area (FEBA) may frequently observe hostile air incursions. When observed, aviation personnel should provide direction of flight and altitude data to an ADA unit.

**WHEN YOU OBSERVE
HOSTILE AIRCRAFT,
YOU SHOULD PROVIDE
DIRECTION OF FLIGHT
AND ALTITUDE DATA
TO AN ADA UNIT**

The DAME and the air defense (AD) element at the division tactical CP serve as the focal point for coordination of air defense operations with other division staff elements as well as performing airspace management functions. The DAME plans and coordinates the immediate use of airspace behind brigade rear boundaries and the future use of airspace over the division as a whole. The AD element at the tactical CP coordinates the immediate use of airspace and ADA operations in the brigade areas. Close coordination between the AD element at the division tactical CP is essential to insure awareness of:

- Army aviation and US Air Force operations.
- Enemy air activity and Threat data.
- Changes in ADA rules of engagement.
- Changes in AD warnings and status of alerts.
- Airspace control measures and restrictions.
- IFF codes.
- ADA unit plans, activities, and statuses.
- Corps/division plans and activities.
- Corps/division priorities of protection.

Below division level, the ADA battery commander, platoon leader, or section leader will most likely be the advisor to the maneuver commander to whom his unit is organic or in direct support.

**COMMAND
AND CONTROL**

All air defense forces must follow certain rules and procedures that provide for centralized management of the total air battle but permit each air defense unit to respond to the needs of the element it supports. It is with this flexibility in mind that the area air defense commander, normally the Air Force component commander, divides the theater into regions for air defense. The region air defense commander is responsible for, and has full authority in, the air defense of his region. He normally delegates authority for employment of organic Army air defense means to the commanders of the major Army elements (e.g., divisions) within his region.

Air defense rules and procedures give the ADA unit commander the criteria he will use to determine if an aircraft is hostile and to establish the degree of control placed on the firing of his weapons.

Hawk and Hercules battalion commanders exercise command and control of their batteries through a battalion operations center. Control of fires of batteries or platoons is accomplished through either the semiautomatic or manual control element of the BOC. Control of fires of Chaparral, Vulcan, and Redeye weapons differs from that of the longer range, more sophisticated Hawk and Nike-Hercules systems in that the elapsed time from target detection and identification until target flyover is measured in seconds rather than minutes. In addition, Chaparral, Vulcan, and Redeye weapons are manned and fired by squads and teams rather than by batteries or platoons. Each squad/team is individually positioned and is separated from all other squads in the same defense. To be effective, the firing decision must be made at the weapon, and authority to engage must be delegated to the weapon commander (Chaparral, Vulcan, or Redeye squad/team leader) subject to prescribed rules of engagement.

**TO BE EFFECTIVE, THE
FIRING DECISION FOR
CHAPARRAL, VULCAN,
OR REDEYE WEAPONS
MUST BE MADE AT THE
WEAPON**

Command and control of the Redeye section is performed by the Redeye section leader from his CP. He positions his Redeye teams to defend units or other assets and to support the scheme of maneuver of the ground unit commander. The region air defense commander controls Redeye fires by issuing air defense rules and procedures that Redeye teams must follow.

Premission planning in relation to air defense artillery involves:

***PREMISSION
PLANNING***

- Knowing locations of air defense assets within your area of operations.
- Knowing how air defense assets fit into the scheme of maneuver.
- Knowing ADA unit radio frequencies, appropriate air defense rules of engagement, and IFF codes/modes.
- Knowing airspace control procedures and restrictions in the area of operations.

All of the above information is made available to maneuver unit/aviation commanders and operations sections. IFF codes/modes are distributed by theater to corps/division via classified information channels. It is up to the corps/division airspace management element to see that IFF codes/modes are distributed to all concerned user units.

IFF

Remember IFF use plays a large part in the air defense rules of engagement because *nonuse* or *misuse* of electronic IFF normally is designated as a major criterion for declaring an aircraft hostile. Make sure you know the IFF codes/modes and how to operate your IFF equipment. If IFF codes/modes have not been distributed, check with—

- ▲ Your unit operations/supported unit operations
- ▲ AME/TOC
- ▲ FOC/FCC
- ▲ AADCP

Knowing appropriate air defense weapons locations, frequencies, and call signs may provide a protective suppression capability against the hostile air threat.

Remember, one quick call to the local AADCP, FCC, or maneuver unit with organic Redeye missile teams may save your life and the lives of others.

● TACTICAL AIR

In joint Army-Air Force operations, the Air Force Component Commander/Commander, Air Force Forces

(AFCC/COMAFFOR) is responsible to the joint force commander for tactical air support operations. In addition, the AFCC/COMAFFOR is designated the area air defense commander (AADC) and the airspace control authority (ACA) with the responsibility for operation of the area airspace management system.

■ PURE AIR FORCE COORDINATING AGENCIES

To help coordinate and control tactical air support and airspace management in the corps area of operations, a system of Air Force/Air Force liaison agencies is employed to support the joint effort.

- ▲ *Tactical air control center (TACC)
- ▲ *Control and reporting center (CRC)
- ▲ Control and reporting post (CRP)
- ▲ Forward air control post (FACP)

*Army liaison provided.

▲ The tactical air control center is responsible for airspace management, Air Force ground sensor surveillance systems, air support coordination and control, and airstrike coordination and control.

▲ The control and reporting center conducts radar control and warning operations within its area of responsibility. The CRC supervises the activities of subordinate radar units and collects, displays, evaluates, and disseminates information on air activities throughout the system. It provides defensive and offensive mission control, navigational and air rescue assistance for friendly aircraft, and threat warning for friendly aircraft.

▲ The control and reporting post augments the CRC by extending radar surveillance and control capabilities.

▲ The forward air control post is a subordinate facility of the CRC and CRP and consists of lightweight surveillance and control radar to extend system coverage, fill gaps, and provide limited extension of control capability.

■ OTHER AGENCIES

In addition to the above coordinating and control agencies, the Air Force provides coordinating/planning agencies to each command level to advise, coordinate, and control tactical air support for the maneuver commander as follows:

- ▲ Corps Direct air support center (DASC)
- ▲ Division Tactical air control party (TACP)
- ▲ Brigade Tactical air control party (TACP)
- ▲ Battalion Tactical air control party (TACP)

▲ The direct air support center is a mobile, air-transportable facility designed to operate with a corps TOC or independent division TOC. The DASC operates in conjunction with the G2/G3 Air and the AME. They aid in advising, planning, and coordination with the TACC for tactical air support in conjunction with combined arms operations. The DASC also provides a fast-reaction capability to satisfy immediate requests from Army forces for tactical air support.

▲ The tactical air control party is a forward operations element attached to each cavalry squadron, maneuver battalion, brigade, regiment, separate brigade, division, and corps. The TACP consists of the air liaison officer (ALO), one or more forward air controllers (FAC), and radio operators, as appropriate. The ALO works in conjunction with the commander, his staff, and the supporting FSE; and assists in the planning for the integration of combined arms fires. The FAC is a tactical fighter pilot assigned to the TACP to control airstrikes in support of maneuver forces. He is also capable of adjusting mortar, field artillery, and naval gun fires. He may operate on the ground or in the air and maintains contact with the strike pilot(s), the requestor, and the fire support coordinator.

PREMISSION PLANNING

Premission planning in relation to tactical air support involves—

- Knowing planned air support and air traffic control plans in relation to the combined arms operation. This involves coordination with unit operations, division G3 Air, or supported maneuver unit commander and S3 Air.

- Knowing how to coordinate and request immediate tactical air support. In order to coordinate and request immediate tactical air support, you must know CEOI frequencies/call signs of supported unit G3/S3 Air agencies.

Remember, all requests for tactical air support must include:

- Target description and situation.
- Target location.
- Desired results.
- Latest allowable time for the airstrike.



Electronic warfare support.

Combat electronic warfare support requires the efforts of each unit, team, and individual, in combined arms operations, to combat the threat EW efforts and—at the same time—render threat forces ineffective through employment of our own EW resources. So when we talk about electronic warfare support, we are not only talking about G2/S2 and organic/attached combat electronic warfare intelligence (CEWI) assets, but also what you can do to render the threat EW effort ineffective and support our EW effort at the same time. Chapter 5 has already outlined threat EW doctrine/capabilities and provided counter/counter-countermeasures to render the threat EW effort ineffective and help our own EW effort.

Responsibility for Army electronic warfare is divided between the G3 and G2, but overall responsibility belongs to the G3. Normally, the EW assets are organic to the CEWI organizations of corps and division.

**ELECTRONIC WARFARE
SUPPORT INCLUDES
WHAT YOU CAN DO
AS AN INDIVIDUAL**

For the most part, CEWI unit support will be directed at division level and above in conjunction with combined arms operational plans. At times, CEWI units may be assigned support missions at brigade level.

Pre-mission planning in relation to EW support involves knowing the current EW threat and activities in the area of operations; knowing the EW support plan for combined arms operations; and planning the flight in relation to the EW threat and available EW support. Threat EW operations will affect flight routes; command and control; and communications procedures.

PREMISSION PLANNING

Threat EW activities can be obtained from the unit S2, division G2, or supported maneuver unit commander/S2. CEWI units support instructions should also be included in the operation order (OPORD).

Flight routes must be planned to take advantage of masking offered by the terrain to render enemy jamming, intrusion, and meaconing ineffective. Command and control communications procedures may have to be altered to fit the situation.

Conversely, friendly EW support may free command and control/communications procedures and allow flight routes to be selected that can better support the mission.

Whether the enemy EW threat and the friendly EW support plan is known or not, good communications security (COMSEC) and timely intelligence reporting should be part of a well-planned mission.



4 Logistical support.

In relation to logistical support premission planning involves:

PREMISSION PLANNING.

○Determining logistical requirements in support of the assigned mission.

○ Knowing locations of available logistical support, frequencies, and call signs.

Logistical requirements should be considered with mission requirements. Mission requirements will partially dictate flight altitudes, modes, speeds, routes, distances, time on station, ammunition requirements, and desired turn-around times.

The mission may not necessitate POL/ammunition requirements over and above those provided at your home base. In another case, prior coordination with aviation units/airfields in the mission area may satisfy logistical requirements. For air cavalry and attack helicopter operations, mission requirements may necessitate the establishment of forward area refuel rearm points (FARRP) to satisfy quick turn-around requirements. TC 1-60, *Forward Area Refuel Rearm Points (FARRP)*, provides detailed guidance on establishment and use of FARRPs to support such operations. Generally, a FARRP will be established to support one air cavalry troop or attack helicopter company. This is necessary to eliminate bottlenecks and decrease enemy detection possibilities. Generally, a FARRP will be highly mobile, air-transportable by utility or medium lift helicopters, and will operate in one area for a limited period of time (3 hrs to 6 hrs).

Maintenance and aircraft recovery procedures/coordination must be planned and disseminated to complement the mission.

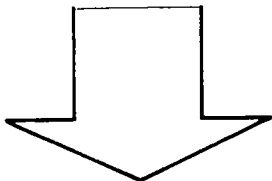
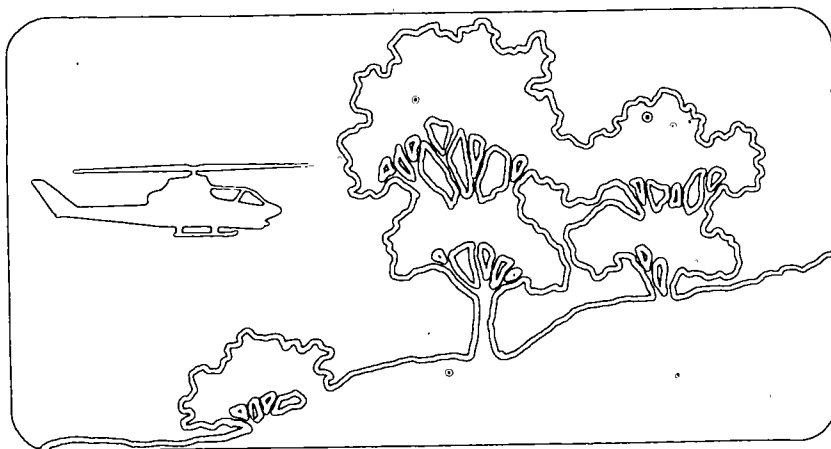
Knowing locations, call signs, and frequencies of available logistical support requires a check/briefing with unit operations and/or the supported unit. Frequencies/call signs are in your CEOI.

SUMMARY

After reading this chapter, one thing that should be clear is the need for combined arms teamwork in a high threat environment. Coordination and planning with support agencies and the supported unit are essential to mission success, maximum effectiveness, and survivability. It will take proficiency; professionalism; and knowledge to plan, coordinate, and execute the mission.

The combat situation will be fast-moving and will require the aviation commander and his operation/intelligence personnel to keep abreast of the friendly/enemy situation. Aviation unit personnel, in turn, must be updated as the situation changes. Unit SOP, training proficiency, and a good information system in the aviation unit will eliminate time-consuming premission planning and briefings.

CHAPTER NINE

**ARMY AVIATION
UNIT SURVIVABILITY
TRAINING****INTRODUCTION**

Army aviation survivability is a function of training. Helicopters will primarily depend on NOE flight to survive, while fixed wing aircraft will primarily use standoff ECM/ECCM and terrain flight as necessary. Aviators must have a detailed knowledge of the threat if he is to employ the proper tactics and/or ASE equipment at the proper time.

Survival training for aviators must begin with the basics. Terrain flight, reduced visibility flight, and ASE operation/interpretation should be practiced until they are instinctive. Tactics are then tailored to the threat situation. As proficiency increases, instincts become more reliable, teamwork more developed, and overall effectiveness increased. As confidence grows, the aviator is better able to concentrate on his primary mission.

Included in this chapter are general training programs which can be tailored to the needs of an individual unit by the commander. References are provided to assist the aviation unit commander in establishing his training program.

AIRCREW TRAINING PROGRAM **AIRCRAFT SURVIVABILITY COUNTERMEASURES**

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct a threat countermeasures training program to include:	Classroom, training area, FTX. (Classification as appropriate.)	Conference, Practical Exercise, Flight Exercise, (Red warning receiver simulator as it becomes available.)	Appropriate Operator's Manual AR 95 Series FM 1-1 FM 1-2 FM 1-5 FM 17-17 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-28 Unit SOP	Aviator can demonstrate knowledge of aircraft survivability countermeasures against selected threat weapons systems to include small arms, ATGMs, air defense guns and missile systems, high performance aircraft/helicopters, and artillery.
Threat small arms countermeasures	Classroom, training area, FTX	Conference, Flight Exercise	Appropriate Operator's Manual AR 95 Series FM 1-1 FM 1-2 FM 1-5 FM 17-17 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-28 Unit SOP	Aviator will know and can demonstrate flight/suppression countermeasures procedures against threat small arms.
Threat ATGM countermeasures	Classroom, training area, FTX	Conference, Flight Exercise	AR 95 Series FM 1-1 FM 1-2 FM 1-5 FM 17-17 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-28 Unit SOP	Aviator will know and can demonstrate flight/suppression countermeasures/procedures against threat ATGM.

AIRCRAFT SURVIVABILITY COUNTERMEASURES

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Threat radar-acquiring air defense missile systems SA-8, SA-6, SA-3, SA-4, SA-2	Classroom, training area, FTX. (Classification as appropriate.)	Conference, Practical Exercise, Flight Exercise. (With radar warning receiver simulator/training aids as available.)	FM 1-1 FM 1-2 FM 17-17 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-28 TCs/TMs (as published) Unit SOP	Aviator knows and can apply appropriate flight/ASE/suppressive countermeasures to defeat the particular threat missile/missile system.
Threat high performance aircraft	Classroom, training area, FTX. (Classification as appropriate.)	Conference, Flight Exercise. (With simulators/training aids and ASE as available.)	FM 1-1 FM 1-2 FM 17-17 FM 90-1 TC 1-4 TCs/TMs (as published) Unit SOP	Aviator knows and can apply appropriate flight/ASE/suppressive countermeasures to defeat the particular high-performance threat/weapon system.
Threat helicopters	Classroom, training area, FTX	Conference, Flight Exercise	FM 1-1 FM 1-2 FM 17-17 TC 1-4 Unit SOP	Aviator knows and can apply appropriate flight/suppressive countermeasures to defeat the threat helicopter.
Threat artillery	Classroom, training area, FTX	Conference, Flight Exercise, Field Exercise	FM 1-1 FM 1-2 FM 17-17 TC 1-4 Unit SOP	Aviator knows and can apply appropriate flight/suppressive countermeasures to defeat threat artillery.

AIRCRAFT SURVIVABILITY COUNTERMEASURES

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Threat optical-acquiring air defense gun systems countermeasures ZPU-4, ZU-23, ZSU-57-2, ZSU-23-4, S-60.	Classroom, training area, FTX	Conference Practical Exercise, Flight Exercise	Appropriate Operator's Manual AR 95 Series FM 1-1 FM 1-2 FM 1-5 FM 17-17 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-28 Unit SOP	Aviator knows and can apply countermeasures flight/suppression techniques against each threat ADA gun system according to its capabilities/limitations.
Threat radar-acquiring air defense gun systems countermeasures ZSU-23-4, S-60	Classroom, training area, FTX. (Classification as appropriate.)	Conference, Practical Exercise. (With radar warning receiver simulator/training aids as available.) Flight Exercise	FM 1-1 FM 1-2 FM 17-17 TC 1-4 TCs/TMs (as published) Unit SOP	Aviator knows and can apply appropriate flight/ASE/suppressive countermeasures to defeat the particular threat weapons system.
Threat optical/infrared missile system countermeasures SA-7, SA-9	Classroom training area, FTX. (Classification as appropriate.)	Conference, Practical Exercise, Flight Exercise. (With simulators, training aids and ASE as available.)	FM 1-1 FM 1-2 FM 1-5 FM 17-17 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-28 TCs/TMs (as published) Unit SOP	Aviator knows and can apply appropriate flight/ASE/suppressive countermeasures to defeat the particular threat infrared missile/missile system.

AIRCRAFT SURVIVABILITY EQUIPMENT

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct an academic ASE training program to include:	Classroom, flightline	Conference, Practical Exercise. (Classification as appropriate.)	Appropriate TCs/TMs (as published) Available Classified Documents FM 1-2 Unit SOP	Aviator will learn operator procedures, recognition factors, and employment procedures/techniques of aircraft survivability equipment. In addition, he will learn what ASE is used to counter various threat systems.
Cheff Dispenser XM-130 (For employment of cheff FFAR, see TC 1-4.)	Classroom, flightline	Conference, Practical Exercise. (Classification as appropriate.)	Appropriate TCs/TMs (as published) FM 1-2 TC 1-4	Aviator will learn operational use of cheff dispenser. He will learn tactical use of cheff in conjunction with the radar warning receiver and maneuver suppression. He will learn which threat systems cheff is effective against.
Flare Dispenser XM-130	Classroom, flightline	Conference, Practical Exercise. (Classification as appropriate.)	Appropriate TCs/TMs (as published) FM 1-2 TC 1-4	Aviator will learn operational use of flare dispenser. He will learn tactical use of flares in conjunction with missile launch/approach detectors and maneuver/suppression. He will learn which threat systems the flare dispenser is effective against.
Infrared Jammers AN/ALQ-144, AN/ALQ-147	Classroom, flightline	Conference, Practical Exercise. (Classification as appropriate.)	Appropriate Classified Documents Appropriate TCs/TMs (as published) FM 1-2	Aviator will learn operational use of Infrared jammers. He will learn tactical use of Infrared jammer in conjunction with maneuver/suppression. He will learn which threat systems Infrared jammers are effective against.

AIRCRAFT SURVIVABILITY EQUIPMENT

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Radar jammers: AN/ALQ-136, AN/ALQ-159	Classroom, flightline	Conference, Practical Exercise. (Classification as appropriate.)	FM 1-2 Appropriate Classified Documents Appropriate TCs/TMs (as published)	Aviator will learn operational use of radar jammer. He will learn tactical use of radar jammer in conjunction with the radar warning receiver and maneuver/suppression. He will learn which threat systems radar jammers are effective against.
Missile launch/approach detectors	Classroom, flightline	Conference, Practical Exercise. (Classification as appropriate.)	Appropriate Classified Documents Appropriate TCs/TMs (as published.) FM 1-2	Aviator will learn operational use of missile launch or approach detector. He will learn to interpret missile launch/approach indications and tactical evasive maneuver, countermeasures, and suppressive measures to be taken. He will learn threat missile systems that missile launch/approach detectors are effective against.
Radar warning receivers: AN/APR-39, AN/ALR-46	Classroom, flightline, simulator (if available)	Conference, Practical Exercise. (Classification as appropriate.)	FM 1-2 TCs/TMs (as published) USAAVNC Training Package including: video tape programed text, graphics	Aviator will learn operational use of radar warning receivers. He will learn to interpret radar warning receiver indications and tactical evasive maneuvers, to be taken in conjunction with indications. He will learn threat systems the radar warning receivers will detect.
Conduct an ASE flight training program (as equipment, simulators, and training aids become available).	Training area, FTX	Flight Exercise	Appropriate TCs/TMs (as published) FM 1-1 FM 1-2 FM 17-17 TC 1-4	Aviator can successfully complete a given mission using tactics, ASE, maneuver and suppression procedures/techniques as appropriate for various threat weapons systems as encountered or injected into the exercise.

AIRCREW TRAINING PROGRAM **FIRE SUPPORT**

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct academic fire support training program to include:	Classroom	Conference/ Practical Exercise	FM 1-2 FM 1-60 FM 6-20 FM 17-47 FM 17-50 FM 17-95 FM 44-1 TC 1-4 TC 1-16 TC 1-88 TC 6-40-4 TC 6-40-6	Aviator can demonstrate knowledge of fire support weapons systems available, their capabilities and limitations, organizational structure, coordinating/communications/control/adjustment procedures, and combined arms tactical employment of fire support organizations/systems.
Air cavalry attack helicopter operations	Classroom	Conference/ Practical Exercise	FM 1-2 FM 17-47 FM 17-50 FM 17-95 TC 1-4 TC 1-16	Aviator is knowledgeable of attack helicopter organizations, missions, weapons systems and capabilities/limitations, fire support coordinating procedures, communications procedures, and combined arms employment considerations.
Air defense artillery support	Classroom	Conference/ Practical Exercise	FM 1-2 FM 1-60 FM 44-1 TC 1-88	Aviator is knowledgeable of air defense artillery organizations, missions, weapons systems and capabilities/limitations, fire support coordinating procedures, communications procedures, and combined arms employment. He will know air defense artillery airspace management interface relationships. He will know ADA weapons status definitions and procedures, ADA IFF challenge procedures and equipment, Army aircraft IFF reply procedures and transponder operations, and how to find or coordinate for IFF codes/modes.

FIRE SUPPORT

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Field artillery support	Classroom;	Conference/ Practical Exercise	FM 1-2 FM 6-20 TC 1-16 TC 1-88 TC 6-40-4 TC 6-40-6	Aviator will demonstrate knowledge of field artillery organizations/structures, missions, weapons systems, and capabilities/limitations. He will know fire support coordinating procedures, communications procedures, and suppression/adjustment techniques/procedures for high explosives, smoke, and illumination munitions. He will know shell/fuze type considerations in relation to type threat targets. He will be knowledgeable of field artillery tactical employment roles.
Tactical air support	Classroom	Conference/ Practical Exercise	FM 1-2 FM 6-20 TC 1-88	Aviator can demonstrate knowledge of available tactical air support, capabilities, and limitations. He can recognize friendly USAF aircraft. He knows USAF fire support agencies providing interface for combined arms operations. He knows how to coordinate for and control tactical air support with proper planning/communications procedures.
Conduct fire support training program	Training area, FTX	Flight Exercise, Field Exercise	FM 1-2 FM 1-60 FM 6-20 FM 17-47 FM 17-50 FM 17-95 FM 44-1 TC 1-4 TC 1-16 TC 1-88 TC 6-40-4 TC 6-40-6	Aviator can coordinate for desired type of fire support, using proper communications, controlling, and adjustment procedures. Aviator can demonstrate proper usage, considerations of fire support systems against varied threat targets in conjunction with assigned mission, and successfully accomplish the mission.

AIRCREW TRAINING PROGRAM **GUNNERY**

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct attack helicopter and door gunner weapons system training program	Classroom, training area, FTX	Conference, Dry Fire Flight Exercise, Live Fire Flight Exercise	FM 17-17, TC 1-4, TC 1-16	As specified in referenced manuals.

AIRCREW TRAINING PROGRAM

PREMISSION PLANNING

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct a premission planning training program to include:	Classroom, training area, FTX	Conference, Practical Exercise, Flight Exercise, Field Exercise	Appropriate Operator's Manuals AR 95 Series FM 1-1 FM 1-2 FM 1-60 TC 1-4 TC 1-5 TC 1-28	Aviator will be able to explain premission planning considerations in accordance with the mission, threat, available support, friendly situation, terrain, and meteorological conditions. Aviator knows coordinating agencies, procedures, and considerations in the planning of the mission. Aviator can give complete mission brief based on mission, scheme of maneuver, enemy/friendly situation, terrain, available support, and weather.
Coordinating procedures	Classroom, training area, FTX	Conference, Practical Exercise, Field Exercise	FM 1-2 FM 1-60	Aviator can demonstrate knowledge of coordination required in planning the mission with the supported unit, ATC, logistics, intelligence, fire support, and internal elements.
Planning procedures	Classroom, training area, FTX	Conference, Practical Exercise, Field Exercise, Flight Exercise	Appropriate Operator's Manual AR 95 Series FM 1-1 FM 1-2 FM 1-60 TC 1-4 TC 1-5 TC 1-28	Aviator will demonstrate knowledge of planning the mission to include route reconnaissance/map reconnaissance; selection of route, route altitudes, ACPs, LZs/PZs, traveling modes; command and control; communications; navigational aids; and suppression as dictated by the mission, friendly situation, the threat, terrain, available support, and weather.
Premission briefing	Classroom, training area, FTX	Conference/ Practical Exercise	FM 1-2	Aviator can give a complete premission briefing based on coordination and planning aspects of the mission.

AIRCREW TRAINING PROGRAM **REDUCED VISIBILITY FLIGHT OPERATIONS**

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct academic tactical instrument flight program to include:	Classroom	Conference/ Practical Exercise	Appropriate Flight Training/Student Guides AR 95-1 AR 95-63 FM 1-5 FM 1-60 Unit SOP	Aviator will demonstrate knowledge of tactical instrument flight operational considerations, planning, procedures, and techniques. He will be knowledgeable of ATC coordinating agencies/procedures and navigation techniques to include NDB, GCA, FM homing and dead reckoning.
Tactical instrument flight operational considerations	Classroom	Conference	Appropriate Flight Training/Student Guides AR 95-1 AR 95-63 FM 1-5 FM 1-60 FM 90-1 Unit SOP	Aviator will demonstrate knowledge of meteorological, threat, and ATC support considerations associated with the conduct of tactical instrument flight. He will be knowledgeable of ATC coordinating procedures/agencies.
Conduct reduced visibility flight training program	Training area, FTXs, daily operational flights	Flight Exercise	Appropriate Flight Training/Student Guides Appropriate Operator's Manual FM 1-1 FM 1-5 FM 1-30 FM 1-60 TC 1-28 - TC 1-33	Aviator will demonstrate flying, navigational, and planning proficiency during periods of reduced visibility to include night/night terrain flight, marginal weather terrain flight, hooded tactical instrument flight. He will also demonstrate proficiency in the use of reduced visibility vision aid equipment and techniques. He will be able to plan and execute a given reduced visibility flight mission.

REDUCED VISIBILITY FLIGHT OPERATIONS

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Night flight safety	Classroom	Conference	AR 95-1 AR 95-5 FM 1-1 TC 1-28 Unit SOP	Aviator will be able to demonstrate knowledge of night flight safety procedures before, during and after night flight. He will also be able to discuss the various ambient light levels; terrain conditions; and visibility limitations that impact on night flight safety considerations.
Night flight navigation and terrain interpretation	Classroom	Conference	FM 1-1 FM 1-5 FM 1-60 TC 1-28 Unit SOP	Aviator will be able to demonstrate knowledge of night flight navigation and terrain interpretation techniques as relates to ambient level and visibility. He will further be able to discuss agencies and navigational aids available to aid in night navigation during combat operations.
Night flight procedures	Classroom	Conference/ Practical Exercises	Appropriate Flight Training/Std Guides Appropriate Operator's Manual AR 95-1 FM 1-1 FM 1-5 TC 1-28 Unit SOP	Aviator can explain and discuss premission planning; preflight considerations; takeoff, en-route, approach, and emergency procedures/considerations as they apply to night flight.

REDUCED VISIBILITY FLIGHT OPERATIONS

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Night vision aids	Classroom and flight-line day/night	Conference/ Practical Exercise	FM 1-1 TC 1-28 TC 1-29 – TC 1-33	Aviator will be able to demonstrate knowledge and use of AN/PVS-5 Night Vision Goggles, their capabilities, limitations, and use techniques. He will be able to discuss preflight night vision aid procedures as they apply to preparation of the aircraft for night flight.
NOE night flight using night vision aids	Classroom	Conference	FM 1-1 FM 1-5 TC 1-28 Unit SOP	Aviator will be able to discuss NOE night flight planning considerations/procedures; limitations; procedures/techniques; navigation; communications; and multi-helicopter operations in conjunction with night vision aids.
Conduct weather operational considerations	Classroom	Conference/ Practical Exercise	AR 95-16 FM 1-1 FM 1-5 FM 1-30 FM 1-60 TC 1-28 Unit SOP	Aviator will be able to discuss meteorological (calling, visibility) considerations as they relate to mission acceptance/ accomplishment and tactical employment. He will also be aware of power/load limitations imposed by reduction in airspeed and altitude. He will demonstrate knowledge in inadvertent IFR procedures as per SOP and coordinating ATC agencies available for assistance.
Marginal weather flight planning and navigation.	Classroom	Conference/ Practical Exercise	FM 1-1 FM 1-5 FM 1-30	Aviator will display knowledge of marginal weather flight planning considerations and techniques, navigational techniques/orientation procedures.

REDUCED VISIBILITY FLIGHT OPERATIONS

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct academic reduced visibility flight training program.	Classroom	Conference/ Practical Exercise	Appropriate Flight Training/Standards Guides Appropriate Operator's Manual AR 95-1 AR 95-16 FM 1-1 FM 1-5 FM 1-60 TC 1-28 TC 1-29 – TC 1-33 Unit SOP	Aviator will demonstrate knowledge of reduced visibility flight techniques, navigation, operational considerations, coordinating procedures, planning procedures, safety requirements, and reduced visibility aids/techniques use and limitations.
Conduct academic night flight training program to include:	Classroom	Conference/ Practical Exercise	Appropriate Flight Training/Standards Guides FM 1-1 FM 1-5 TC 1-28 TC 1-29 – TC 1-33 Unit SOP	Aviator can demonstrate knowledge of night flight techniques, operational considerations, navigation, preflight considerations; and use, capabilities, and limitations of night vision aids. He will also be able to explain emergency procedures, safety procedures, and night terrain flight techniques utilizing night vision aids.
Night vision	Classroom	Conference	TC 1-28	Aviator will be able to discuss the physical and psychological effects of night flight in relation to the body and vision.

REDUCED VISIBILITY NIGHT OPERATIONS

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct night flight training program	Training area, FTXs, daily operational missions. Ambient light levels as prescribed in TC 1-28. (Night NOE with AN/PVS-5 goggles conducted by qualified IP or aviator qualified by IP.)	Flight Exercise	Appropriate Flight Training/Stan Guides Appropriate Operator's Manual AR 95 series TC 1-28 - TC 1-33 Unit SOP	Aviator, platoon, and unit will demonstrate proficiency in night/night terrain flight procedures and techniques to include planning, preflight, navigation, and use of night vision aids/techniques. Aviator will be able to execute disorientation procedures and demonstrate knowledge of navigational and reorientation procedures.
Conduct marginal weather training program	Training area, FTXs, daily operational missions	Flight Exercise	Appropriate Flight Training/Stan Guides Appropriate Flight Supplements, Charts, and Maps Appropriate Operator's Manual AR 95 series FM 1-1 FM 1-5 FM 1-30 FM 1-60 Unit SOP	Aviator, platoon, and unit will demonstrate proficiency in marginal weather terrain flight, procedures, techniques, planning, and navigation to include IMC procedures and execution. Aviator will demonstrate proficiency in use of available ATC agencies and available navigational aids/procedures in IMC condition. He will be able to execute disorientation procedures and display judgment in decisions relating to weather criteria in accomplishing/postponing the mission.

REDUCED VISIBILITY FLIGHT OPERATIONS

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct tactical instrument flight program	Training area, FTXs, daily operational missions. (All tactical instrument flight conducted below prescribed altitudes and current regulation rules will be hooded with qualified observer certified by unit IP.)	Flight Exercise	Appropriate Flight Sten Guides Appropriate Flight Supplements, Charts, and Maps Appropriate Operator's Manual AR 95 series FM 1-5 FM 1-30 FM 1-60 Unit SOP	Aviator will demonstrate proficiency in tactical instrument flight planning, coordinating, and navigation procedures and techniques in conjunction with a simulated mission and threat. He will be able to plan and execute a given mission using ATC agencies/NAVAIDS to include navigation/approaches by NDB, GCA, FM homing, and dead-reckoning techniques.

AIRCREW TRAINING PROGRAM TERRAIN FLYING

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct academic terrain flight training program to include:	Classroom	Conferences/ Practical Exercises	See FM 1-1 for complete academic training program.	Aviator will be able to demonstrate knowledge of terrain flight modes; methods and procedures; mapreading and navigation techniques; associated human, safety, and operational factors.
Introduction and safety	Classroom	Conference/ Practical Exercises	Appropriate Operator's Manual AR 95-1 AR 95-16 FM 1-1 FM 1-5 FM 17-17 Training Film 46-4920 "Down to Earth NOE" Unit SOP	Aviator will demonstrate knowledge of terrain flight modes; methods of movement; maneuver, reconnaissance, and firing techniques (as appropriate); and hazards associated with terrain flying/ramjet procedures. Aviator will demonstrate knowledge of unit training/safety SOP, local restricted areas, hazards map, and procedures relating to designated duties/safety checks as stipulated per SOP.
Human factors impacting on terrain flying		Conference	AR 95-1 FM 1-1 TC 1-20	Aviator will discuss related factors of terrain flying peculiar duties, such as scanning, acquisition techniques, cockpit teamwork in correlation with operational skill fatigue and crew selection. He will be able to recognize symptoms of such fatigue.

TERRAIN FLYING

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct terrain flight training program to include:	Training area, FTXs, daily operational missions	Flight Exercise	Appropriate Operator's Manuals AR 95-1 AR 95-16 Flight Training Stan/Maneuver Guides FM 1-1 FM 1-5 FM 17-17 FM 21-26 TC 1-20 Unit SOP	Aviator will demonstrate proficiency in low-level, contour, and NOE flight; associated maneuvers; navigation techniques; communication procedures; required cockpit teamwork; emergency procedures; and flight safety computations/knowledge.
Low-level flight refresher training	Training area, FTXs, daily operational missions	Flight Exercise		
Contour flight refresher training	Training Area, FTXs	Flight Exercise		
NOE flight refresher and advanced training	Training area, FTXs	Flight Exercise		

TERRAIN COYUNGS

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Terrain flying operational considerations	Classroom		Appropriate Operator's Manual Appropriate Sten/Maneuver Guides FM 1-1 Unit SOP	Aviator will demonstrate knowledge of cockpit teamwork, duties, and procedures. He will be able to discuss advantages/disadvantages of each type terrain flight. He will demonstrate knowledge of emergency procedures critical during terrain flight modes and their execution.
Terrain analysis using a tactical map and aerial photographs	Classroom	Conference/ Practical Exercise	FM 1-1 FM 1-5 FM 21-26	Aviator will demonstrate proficiency in identification of terrain features as depicted on tactical map and aerial photo. Based on map/aerial photo study, aviator will be able to select a route of flight and flight methods that afford protection from enemy detection, provide masking, and utilize unexpected routes. He will further be able to select useful checkpoints that can be seen, based on route selection; select landing zones, observation, and firing points affording adequate room, masking, and best tactical advantage.
Terrain flight navigation techniques	Classroom	Conference/ Practical Exercise	FM 1-1 FM 1-5 FM 21-26 Unit SOP	Aviator will demonstrate knowledge of techniques used for navigation during NOE, contour and low-level flight. He will be able to explain the effects of weather, season changes and light changes on NOE navigation. He will be able to explain the navigation techniques associated with various types of terrain. He will be able to describe terrain features expected to be seen, based on a selected tactical map route. He will be able to discuss communication procedures/techniques peculiar to NOE navigation.

AVIATION UNIT TRAINING PROGRAM ELECTRONIC WARFARE ENVIRONMENT

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct academic electronic warfare training program	Classroom	Conference	FM 1-2 FM 32-30 TC 32-10 TC 32-20 TC 100-32-1 Unit SOP	Aviation unit personnel will be knowledgeable of types of electronic warfare and how they are directed against them. They will be knowledgeable of ECM/ECCM procedures and techniques used against the signal intercept, direction-finding, jamming, deception, intrusion, and interference threats. They will know what an MIJI report is and how to prepare/submit one. They will be familiar with unit SOP communications procedures when operating in an electronic warfare environment.
Conduct electronic warfare training	Training area, FTX	Practical Exercise, Field Exercise, Flight Exercise	FM 1-2 FM 32-30 TC 32-10 TC 32-11 TC 32-20 TC 100-32-1 Unit SOP	Aviation unit personnel will demonstrate ability to operate successfully in an electronic warfare environment through the proper use and employment of ECM/ECCM procedures and techniques.

**AVIATION UNIT TRAINING PROGRAM
NBC WARFARE ENVIRONMENT**

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct unit NBC training program.	Classroom	Conference	FM 1-2 FM 21-40	Aviation unit personnel will be knowledgeable about effects of nuclear, biological, and chemical warfare. They will know the symptoms/first-aid measures applicable to NBC materials and preventive, protective, and decontamination measures/procedures to be taken. They will know how to operate unit NBC test/detection equipment. They will know procedures for operating in an NBC environment and how to use protective equipment/procedures. They can recognize NATO standard warning signs.
Conduct unit NBC training program.	Unit area, training area, FTX	Practical Exercise, Field Exercise, Flight Exercise	FM 1-2 FM 21-40	Aviation unit personnel will be able to meet prescribed standards for recognition, protective/first aid, and operational use procedures when subjected to a given NBC situation. They will be able to decontaminate themselves and TOE equipment as appropriate for a given situation. Selected personnel will be able to conduct test and monitoring operations in accordance with a given situation. Aviation unit personnel and aircraft will successfully demonstrate their ability to perform the assigned mission in a given nuclear, biological, or chemical warfare environment using proper protective, communications, and operational procedures.

AVIATION UNIT TRAINING PROGRAM
BOOTH DORE AT ENVIRONMENT ORIENTATION

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct high threat environment orientation academic training program to include:	Classroom	Conference/ Practical Exercise	FM 1-1 FM 1-2 FM 17-47 FM 17-50 FM 17-95 FM 30-103 FM 90-1 FM 100-5	Aviation unit personnel will demonstrate knowledge of threat doctrine, tactics, and equipment/equipment capabilities and limitations. In addition, unit personnel will learn how Army aviation will counteract the threat through use of tactics and survivability countermeasures.
Introduction to the high threat environment	Classroom	Conference	FM 90-1 FM 100-5	Aviation unit personnel will become familiar with doctrine, tactics, and weapons systems that will operate on the present and future battlefield, lethality and force ratios expected to be encountered. They will know what impact the high threat environment will have on US Army doctrine tactics, and how the Army and Army aviation will have to operate in order to survive and win while outnumbered.
Threat offensive/defensive doctrine and tactics	Classroom	Conference	FM 1-2 FM 17-47 FM 30-102 FM 90-1	Aviation unit personnel will be familiar with threat offensive/defensive, combined arms organization and employment doctrine and tactics with emphasis on air defense artillery employment, electronic warfare, NBC employment, and reduced visibility operations.

HIGH THREAT ENVIRONMENT ORIENTATION

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Threat weapons systems	Classroom	Conference/ Practical Exercise	FM 1-2 FM 17-47 FM 30-102 FM 90-1 FM 100-5	Aviation unit personnel will be familiar with threat weapons systems, capabilities, and limitations to include small arms, ATGMs, air defense, tac air, and artillery. In addition, they will be familiar with threat weapons assignment to type units.
Aviation unit survival in a high threat environment	Classroom	Conference/ Practical Exercise	FM 1-1 FM 1-2 FM 1-60 FM 17-47 FM 17-50 FM 17-95 FM 90-1 TC 1-28	Aviation unit personnel will be knowledgeable of specific tactics and measures/countermeasures to be employed in order to survive in a high threat environment. Emphasis on use of cover and concealment, OPSEC, NBC protective measures, 24-hour operations, terrain flight, and an overview of ASE equipment.

AVIATION UNIT TRAINING PROGRAM OPERATIONS SECURITY

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct operations security training program to include:	Classroom, training area, FTX	Conference, Practical Exercise, Flight Exercise, Field Exercise	FM 1-2 FM 6-50 FM 24-1 FM 32-6 FM 90-2 FM 90-4 TC 100-32-1 Unit SOP	Aviation unit personnel will demonstrate knowledge in operations security measures, countermasures, and techniques to include deception, physical security, signal security, and information security.
Deception training	Classroom, training area, FTX	Conference, Practical Exercise, Flight Exercise, Field Exercise	FM 1-2 FM 90-2 TC 100-32-1	Aviation unit personnel will learn and use the principles of cover and concealment (camouflage techniques of night/reduced visibility operations and movement); and other ground deception measures such as helicopter decoy considerations, antenna location/decoy measures. The aviator personnel will learn techniques to use in taking advantage of terrain vegetation, shadows and colors to provide inflight cover and concealment.
Physical security training	Classroom, FTX	Conference, Field Exercise	FM 6-50 FM 90-4 Unit SOP	Aviation unit personnel will demonstrate knowledge and procedures used in defense of position areas to include perimeter establishment/defense weapons positions and fields of fire, listening posts, barriers, light/noise discipline, and use of challenge/passwords.

OPERATIONS SECURITY

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Information security training	Classroom, FTX	Conference, Field Exercise	FM 1-2 FM 24-1 FM 32-10 TC 100-32-1 Unit SOP	Aviation unit personnel will be knowledgeable of the procedures and penalties for the protection of classified materiel. They will be aware of how classified information can be disclosed through written, verbal or graphic communications and how classified materiel should be destroyed.
Signal security training	Classroom, FTX	Conference, Practical Exercise, Flight Exercise, Field Exercise	FM 1-2 FM 24-1 FM 32-6 TC 100-32-1 Unit SOP	Aviation unit personnel will demonstrate knowledge of signal security procedures and techniques used when operating radios, antennae, beacons, telephones, and ASE. They will be knowledgeable and practice proper radio/communication procedures and discipline; use of CEOI, codes, and modes; ASE; and use/placement of antennae/beacons. Aviation personnel will demonstrate communications/ASE use and proper alternate means of communications in accordance with unit SOP while actively engaged in a combat mission.

AIRCREW/ATC TRAINING PROGRAM

AIRSPACE MANAGEMENT IN A COMBAT ZONE

TASK	CONDITION	TYPE INSTRUCTION	REFERENCES	TRAINING/EVALUATION STANDARDS
Conduct a combat-oriented airspace management program	Classroom	Conference/ Practical Exercise	Appropriate Soldier's Manuals FM 1-2 FM 1-60 FM 100-42 Unit SOP	Aircrew and ATC unit personnel will demonstrate knowledge of combat airspace purpose, management organization/control, procedures, and methods of coordination/communications procedures. They will be knowledgeable of coordination/control interface with Air Force and combat support organizations/agencies. They will be knowledgeable of tactical employment concepts/procedures of available ATC resources.
Conduct a combat-oriented airspace management program	FTX	Field Exercise	Appropriate Soldier's Manuals FM 1-2 FM 1-60 FM 100-42 Unit SOP	Aircrew and ATC unit personnel can successfully apply academic knowledge of airspace management and air traffic control coordination/procedures in planning/executing assigned missions.

SUMMARY

The foregoing training programs are in a generalized format to allow the type unit and the unit commander to adapt them to the particular training requirements as appropriate. In building the training proficiency of the unit, it is recommended that the aviator/unit build proficiency in specified areas through classroom, practical exercise, and flight exercise in the local training area. During field exercises the whole program can be integrated and weak areas identified. In the final phase, the unit ARTEP will evaluate unit proficiency. Training aids, simulators, and aircraft survivability equipment availability may prohibit hands-on training techniques in some cases. However, basic flight/suppressive countermeasures for survival in the high threat environment still apply and will continue to apply. We must train now with what tactics, techniques, and equipment are available to enable better integration with tactics and equipment of the future. We must be able to perform the mission and survive under any conditions should the situation demand mobilization. We cannot afford to waste men and materiel on the battlefield due to lack of training proficiency.

APPENDIX A**REFERENCES****Publication Indexes**

Department of the Army pamphlets of the 310-series should be consulted frequently for latest changes or revisions of references listed and for new publications on subjects covered in this manual. (References include draft, test, and proposed publications which may be in print by the time this FM is in DA print.)

Army Regulations	Title
AR 95-1	Army Aviation: General Provisions and Flight Regulations
AR 310-25	Dictionary of United States Army Terms
AR 310-50	Authorized Abbreviations and Brevity Codes
Field Manuals	Title
FM 1-1	Terrain Flying
FM 1-5	Instrument Flying and Navigation For Army Aviators
FM 1-60	Airspace Management and Army Air Traffic in a Combat Zone
FM 1-80	Aerial Observer Techniques and Procedures
FM 1-105	Aviator's Handbook
FM 3-8	Chemical Reference Handbook
FM 3-12	Operational Aspects of Radiological Defense
FM 3-22	Fallout Prediction
FM 5-20	Camouflage
FM 6-20	Fire Support in Combined Arms Operations
FM 6-50	The Field Artillery Cannon Battery
FM 17-47	Air Cavalry Combat Brigade
FM 17-50	Attack Helicopter Operations
FM 17-95	Cavalry

APPENDIX A**REFERENCES**

Field Manuals	Title
FM 21-40	Chemical, Biological, Radiological and Nuclear Defense
FM 21-41	Soldier's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare
FM 21-60	Visual Signals
FM 24-1	Combat Communications
FM 24-18	Field Radio Techniques
FM 30-5	Combat Intelligence
FM 30-102	Opposing Forces Europe
FM 32-1	Signal Intelligence (SIGNET)
FM 32-6	SIGSEC Techniques
FM 32-30	Electronic Warfare, Tactics of Defense
FM 44-1	US Army Air Defense Artillery Employment
FM 44-3	Air Defense Artillery Employment--Chapparral/Vulcan
FM 44-96	Air Defense Artillery Employment--Hawk
FM 71-1	The Tank and Mechanized Infantry Team
FM 71-2	The Tank and Mechanized Infantry Task Force
FM 71-100	TBP Brigade and Division Operations (Mechanized/Armor)
FM 90-1	Employment of Army Aviation Units in a High Threat Environment
FM 90-2	TBP Tactical Deception
FM 90-4	TBP Air Assault Operations
FM 90-6	TBP Mountain Operations
FM 100-5	Operations
FM 100-10	Combat Service Support
FM 100-32 (TEST)	Electronic Warfare Doctrine
FM 100-42 (TEST)	US Air Force/US Army Airspace Management in an Area of Operations

APPENDIX A	REFERENCES
Training Circulars	Title
TC 1-4	Helicopter Gunnery
TC 1-16 TC 1-28	Employment of Aircraft Flares From Army Aircraft Rotary Wing Night Flight
TC 1-88	Aviator's Recognition Manual
TC 6-40-4	Fire For Effect
TC 6-40-6	Field Artillery Aerial Observer Team Operations
TC 17-17	Gunner Training for Attack Helicopters
TC 32-10	How to Train a Battalion to Fight in an Electronic Warfare Environment
TC 100-32-1	Electronic Warfare, A Weapons Qualification Course
Classified References	Title
(C) FM 32-20	Electronic Warfare (EW) (U)
(C) Booklet	TRADOC Bulletin #4, dated January 1976 (U)
(C) Paper	Survivability of Army Aircraft (AAH) as a Function of Exposure Time, dated August 1972 (U)
(S) ECOM Booklet—4449	Electronic Warfare Protection of Army Aircraft (U)
(S) Booklet	AN/APR 39/41 Minichaff Tech Report, dated October 1976 (U)
(S) Booklet	Advanced Radar Jammer AN/ALQ 136, dated December 1973 (U)
(S) After Action Report	F15/Helicopter Maneuver Test, dated October 1976 (U)

APPENDIX A	REFERENCES
Classified References	Title
(S) Information Paper (S) Report (S) Report (S) Report (S) Report (S) Briefing (S) Booklet (S) Booklet (S) Booklet (S) Report (S) Booklet (S) Report (S) Report (S) Booklets (S) Report (S) Report	Air-to-Air Role, US Helicopter vs Soviet Aircraft, dated May 1976 (U) AN/ALQ-136 Effectiveness Test, dated February 1976 (U) AN/ALQ-156 Missile Detector System, dated March 1976 (U) AN/ALR-46 Operational Test and Evaluation, H-53, dated February 1976 (U) Armed Soviet Helicopter Threat to US Helicopters, dated February 1976 (U) Briefing on Hellfire, dated July 1976 (U) SA-7 Missile System, dated January 1976 (U) SA-8 Missile System, dated July 1976 (U) SA-6 Missile System, dated October 1976 (U) SA-6 Countertactics, dated January 1976 (U) S-60 AAA Soviet Weapons System, dated June 1972 (U) HIND Helicopter, dated January 1976 (U) Helicopter/Fighter Evasive Maneuvers, dated August 1976 (U) Soviet Quad 23mm, ZSU-23-4 Countermeasures Test, dated June and July 1976 (U) FM 341 Test, Eglin AFB (U) FM 350 Test, Fort Hood, Texas (U)

APPENDIX B

GUIDE TO WRITING AN ABC ANNEX
TO THE UNIT SOP

(Classification)

Annex---(Aircraft Battlefield
Countermeasures and Survivability)
to SOP #_____

---Assault Helicopter Company

---Attack Helicopter Company

---Air Cavalry Troop

1 Jan 197____

1. Purpose: This purpose establishes aircraft battlefield countermeasures and survivability procedures applicable to the conduct of air missions in a tactical environment.

2. Scope: This annex is applicable to all unit aircrew personnel.

3. Concept: Procedures in this annex are established to provide countermeasure and survivability techniques to be adhered to as a minimum in the conduct of aircrew combat missions. Specific countermeasures will be according to the situation and are inappropriate for inclusion in SOP.

4. Procedures: Procedures in this portion of the annex should be designed with the unit mission, the threat, and the combat environment (climate and terrain) in mind. Some procedures applicable to modern warfare that should be established in an annex of this nature are listed below.

a. Premission planning and coordination. Included should be minimal safety and coordination measures necessary to insure the aircrew starts the mission with a reasonable chance of completion and is tied into the combined arms team concept of combat operations.

(1) Weather forecast and check.

(2) Operations and S2 brief.

(Classification)

(Classification)

ANX---(Acft Batfld Ctms and Surv) to SOP #_____

(3) Safety requirements and survivability equipment (survival vest, protective mask, etc.).

(4) Coordination with supported unit commander/S3.

(5) Route reconnaissance and planning procedures.

(6) Support requirements (fire support air traffic control (ATC), logistics, etc.) and planning.

(7) Airspace management coordination identification, friend or foe (radar) ((IFF) codes/modes, air corridors, altitude/airspace restrictions, etc.).

(8) Aircrew briefing procedures.

b. *Flight procedures.* Included should be general procedures that optimize aircraft survivability based on terrain and the threat.

(1) Flight attitudes/modes in relation to the forward edge of the battle area (FEBA) and the threat tactical situation. Examples of flight altitudes might be: No higher than 500 feet from 20 kilometers (km) to 40 km from the FEBA; low-level from 10 km to 20 km from the FEBA; contour level from 5 km to 10 km from the FEBA; NOE 5 km and closer to the FEBA. Flight modes might be: Traveling mode when enemy contact is not likely; traveling overwatch when contact is possible; bounding overwatch when in enemy contact.

(2) Standoff distances in relation to threat weapons systems.

(3) Targeting, handoff, and engagement procedures.

(4) Exposure times.

(5) Decoy techniques during engagements.

c. *Flight routes.* Included should be procedures that optimize survivability in relation to the tactical situation. Examples might be:

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(Classification)

ANX---(Acft Batfld Ctms and Surv) to SOP #_____

(1) No closer than ____km to known enemy air defense artillery (ADA) emplacement, if possible.

(2) A minimum of a start point (SP), ____command posts (CP), reporting points (RP) and ____checkpoints.

(3) No closer than ____km to friendly ADA/artillery positions.

(4) Will not utilize prominent terrain features, built-up areas for flightpaths/checkpoints, if possible.

(5) Will not make approaches/ascents from/to altitudes direct to/from friendly positions.

(6) Will designate primary and alternate PZs or LZs and firing positions.

d. Communications. Specific communications procedures should be referred to and included in a separate communications annex. Procedures should include communications security (COMSEC) principles in relation to use/nonuse of radio communications, should emphasize good premission planning and briefings to lessen communications requirements, emphasize teamwork, and illustrate alternate codes, signals, and methods for communications when operating under radio silence or in an electronic warfare environment.

e. Nuclear, biological, and chemical (NBC) operations. Specific procedures should be referred to and included in a separate NBC annex. Procedures should include the use and wearing of protective equipment, decontamination of personnel and equipment, protective countermeasure to be employed while conducting a flight mission, monitoring requirements, and maximum dose rates in relation to time in a nuclear environment.

f. Reduced-visibility operations. Included might be procedures for:

(1) Visibility and ceiling requirements for safe flight operations.

(2) Required equipment, its use and care.

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ANX---(Acft Batfld Ctms and Surv) to SOP #_____

(3) Flight planning requirements such as ATC/NAVAIDs, maps, charts, navigation techniques, and approach/departure procedures.

(4) Aircraft formations and flight separation requirements.

(5) Inadvertent meteorological conditions procedures.

(6) Reduced-visibility flighttime limitations and rest requirements.

(7) Aircraft lighting procedures and preflight requirements.

(8) IFR emergency procedures when engaged by threat air defense artillery (ADA) systems.

g. Aircraft survivability equipment. Included should be procedures for the use and care of aircraft survivability equipment. Training requirements should be referred to and included in the unit training SOP. User procedures might include:

(1) Operational requirements/restrictions in relation to communications security and in an electronic warfare/nuclear environment.

(2) Maneuver procedures in response to radar warning receiver indications.

(3) Aircraft survivability equipment countermeasure procedures in relation to radar warning receiver indications and various threat weapons systems.

h. Threat air defense artillery and missiles. Included might be:

(1) Engagement parameters and procedures for various threat weapons systems.

(2) Engagement restrictions for certain threat weapons systems.

(3) Maneuver countermeasure procedures applicable to detection avoidance or evasion when being tracked or engaged.

(4) Required reports or coordination procedures upon locating or being engaged by threat weapon systems.

(Classification)

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ANX---(Acft Batfld Ctms and Surv) to SOP #_____

i. Air-to-air combat. May include:

- (1) Rules of engagement such as "only in self-defense or defense of friendly forces."
- (2) Maneuver procedures when being engaged by threat air vehicles.
- (3) Support coordinating procedures and requirements.

5. Responsibilities:

a. Unit commander. The unit commander is responsible to advise his immediate commander or the supported unit commander, as appropriate, on procedures/restrictions as set forth in this annex. He is responsible for unit aircrew countermeasure and survivability training; to insure that these personnel are aware of procedures established in this annex; and that they are adhered to during combat flight operations.

b. Platoon leaders. Platoon leaders are responsible to the unit commander for:

- (1) Insuring subordinates read, understand, and comply with procedures set forth in this annex.
- (2) Advising him on training requirements to support procedures as set forth in this annex.
- (3) Keeping him current on countermeasure and survivability training proficiency.
- (4) Recommending changes to the procedures set forth in this annex.

c. Aircrew personnel. Aircrew personnel are responsible to platoon leaders for:

- (1) Compliance of procedures as set forth in this annex.
- (2) Recommending changes as required to procedures contained in this annex.

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FM 1-2

7 JULY 1978

By Order of the Secretary of the Army:

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General, United States Army
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FM 1-2

AIRCRAFT BATTLEFIELD COUNTERMEASURES AND SURVIVABILITY (ABC'S)

QUESTIONNAIRE

As the user of this publication, we are vitally interested in making you a member of our writing team. You are encouraged to provide us with your opinion of this publication by filling out this questionnaire. Please be sure to include your name, AUTOVON number, and unit so that we can follow up on your suggestion or comments.

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1. Did you have any difficulty understanding the material presented in this publication? ☐ Yes
If your answer is Yes, which part(s) was unclear? ☐ No

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4. To your knowledge, are any of the techniques or procedures contained in this publication in ☐ Yes
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